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Collins Radio Company

514A-3/4/5
Radio Set Control

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514A-3/4/5
Radio Set Control

This instruction book includes:

Description and Principles of Operations	*523-0762549*
Operation	*523-0762550*
Maintenance	*523-0762551*
Parts List	*523-0762594*
Diagrams	*523-0762552*

Printed in the United States of America

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514A-3/4/5 Radio Set Control

COLLINS

description and principles of operations

Printed in U.S.A.

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table of contents

Paragraph		*Page*
1.	*General*	1
2.	*Purpose of Equipment*	1
3.	*Equipment Specifications*	1
3.1	Electrical Specifications	1
3.2	Environmental Specifications	2
4.	*Physical Description*	2
5.	*Principles of Operation*	2
5.1	General	2
5.2	Functional Theory	2
5.3	Detailed Theory	7
6.	*Difference Data*	11

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List of Effective Pages

*The asterisk indicates pages changed, added, or deleted by the current change.

Page No	Issue
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*Title	15 Dec 71
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*1 thru 5	15 Dec 71
6 Blank	15 June 70
*7 thru 9	15 Dec 71
10 Blank	15 June 70
*11	15 Dec 71
12 Blank	15 June 70

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description and principles of operation

1. GENERAL

This section presents the purpose, specifications, general description, and principles of operation of the 514A-3/4/5 Radio Set Control (Collins part numbers 792-6121-001, 792-6122-XXX, and 792-6123-001).

2. PURPOSE OF EQUIPMENT

The 514A-3/4/5 Radio Set Control (figure 1) permits manual control of an hf communication system that uses serial-digital techniques.

3. EQUIPMENT SPECIFICATIONS

3.1 Electrical Specifications

Frequency range	2 to 29.9999 MHz.
Frequency channels	280,000 in 100-Hz increments.
Operational modes	USB, LSB, AM, CW, narrow band secure voice (SVU or SVL), and RF TEST on all units except 514A-4, CPN 792-6122-003, which has USB, LSB, AM, and RF TEST.

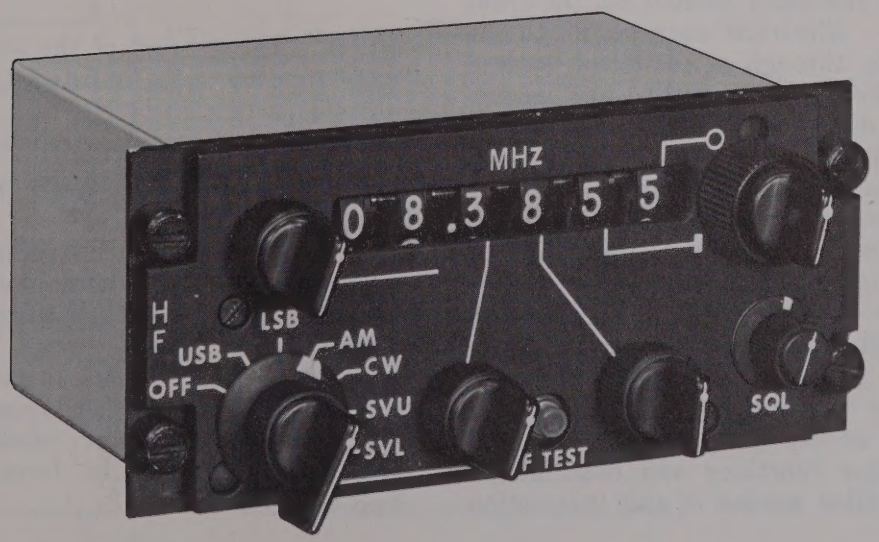


Figure 1. 514A-3/4/5 Radio Set Control.

Front panel lighting.....28- or 5-volt edge lighting per MIL-P-7788C type V, class 1-W.

Power requirements..... 28 or 5 volts, 1.0 A for panel lighting; 28 volts dc for RF TEST lamp (from rcvr/exctr unit): +15 volts dc continuous (from rcvr/exctr unit).

3.2 Environmental Specifications

Altitude .....0 to 40,000 feet.

Temperature .....-55 °C to +71 °C (-65 °F to +160 °F).

Humidity.....Up to 95% relative at 50 °C (+122 °F).

Vibration .....±2 g at 55 to 500 Hz.

Crash safety .....30 g in each of three planes.

4. PHYSICAL DESCRIPTION

The 514A-3/4/5 Radio Set Control chassis is made of aluminum and is designed for 4-point console mounting. The control is mounted using four Dzus fasteners located on the front panel (figure 1). Electrical connections to the control are made through a connector located on the rear of the unit (see outline and mounting dimensions diagram in the diagrams section of this manual). One plug-in printed circuit board contains logic circuits to convert the parallel wire control information from rotary switches into serial-digital output. A shielded submodule contains a dc to dc converter to provide +5 Vdc for the logic circuits. The logic circuits consist primarily of integrated circuit flatpacks. The selected operating frequency is displayed by a mechanical digital indicator on the front panel. For controls and indicator functions and descriptions refer to the operation section of this instruction book.

5. PRINCIPLES OF OPERATION

5.1 General

The 514A-3/4/5 Radio Set Control provides a manual input for frequency selection, mode (function) selection, and squelch control of an associated hf communication system. Control information is transferred to the hf system by a serial-digital control word transmitted through a shielded, twisted-pair control bus.

The 514A-3/4/5 provides a selection of 280,000 communications channels covering the frequency range from 2.0000 to 29.9999 MHz in 100-Hz increments. Frequency selection is made by positioning five frequency selector switches on the front panel. A mode selector switch on the front panel provides a selection of upper sideband (USB), lower sideband (LSB), amplitude modulation (AM), continuous wave (CW), narrow band secure voice upper (SVU), narrow band secure voice lower (SVL), or RF TEST. A squelch (SQL) control, also on the front panel, provides a selection of eight squelch threshold level settings for the audio circuits in the associated hf system. Single-line inputs through the rear connector are available for ptt keying and VOX enable lines controlled by external remote switches. The control information selected by positioning the five switches on the front panel is a parallel binary coded decimal (bcd) signal. The logic circuits convert the parallel control information into a 32-bit control word that is transmitted serially through a single-pair 2400-Hz bus.

Front panel lighting of the 514A-3/4/5 is of the edge lighting type, unfiltered white at 28 or 5 volts dc or ac.

5.2 Functional Theory (Refer to figure 2).

The desired control instructions are inserted into the 514A-3/4/5 Radio Set Control by positioning the control switches located on the front panel. A push-to-talk (key) switch, for control of voice communications, is located on the operator's microphone. The control switches provide binary coded decimal (bcd) information, in parallel form, to the modulo-two transmit card A2.

Modulo-two transmit card A2 accepts the parallel binary signals from the control switches, develops a control data word from these inputs, and transmits the control word in bit serial mode to the receiver-exciter.

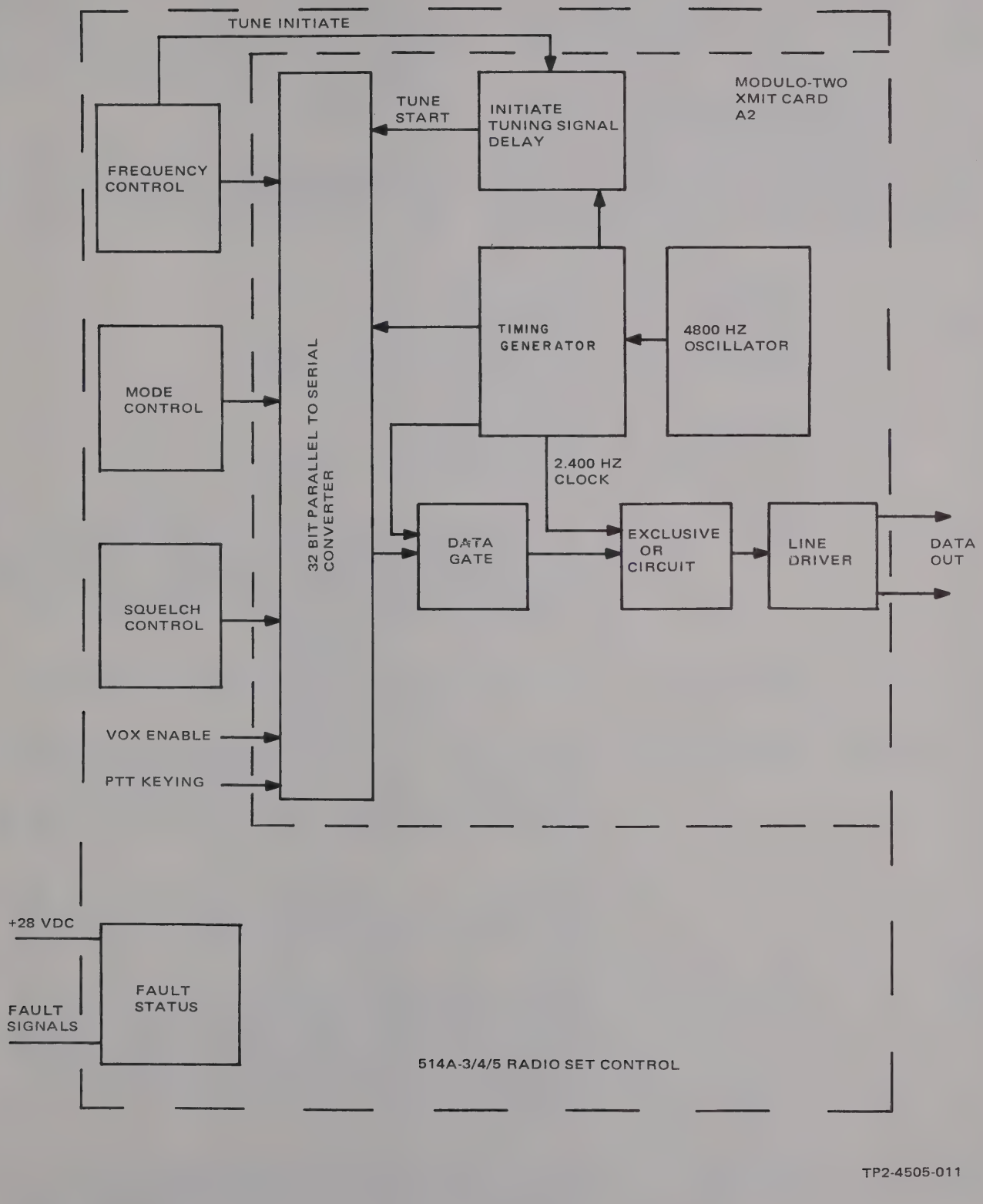


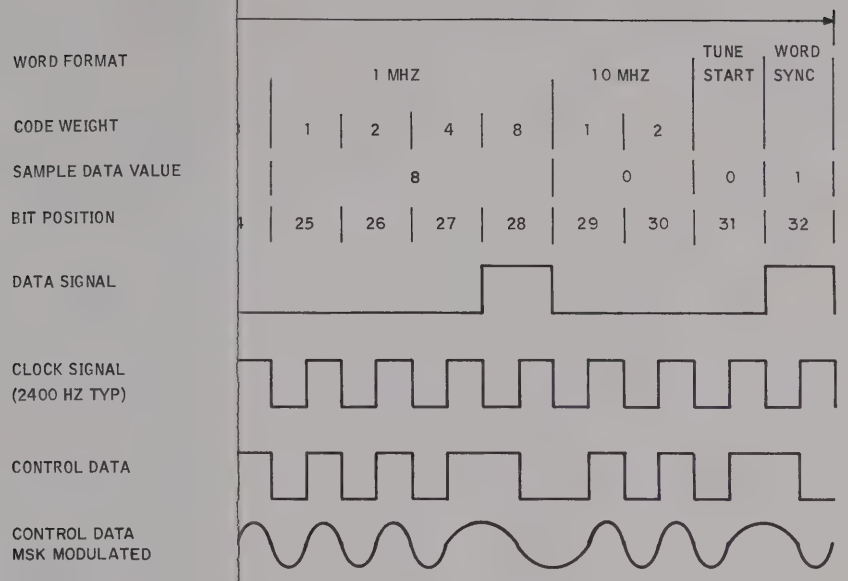
Figure 2. Functional Block Diagram.

All timing signals used by the 514A-3/4/5 are derived from a single source, an astable multivibrator located on A2 and operating at 4800 Hz ±5 percent. The 4800-Hz output of the multivibrator is applied to the timing generator circuit that provides timing (clock) signals throughout the 514A-3/4/5.

Control information, in binary parallel form, is applied from the control switches to a 32-bit parallel-to-serial converter circuit. The serial data output of the converter is applied through a data gate circuit to an exclusive OR circuit where it is combined (modulo-two added) with the 2400-Hz bit clock signal. The output of the exclusive OR circuit forms the serial data control signal that is applied to a line driver stage to provide a dc balanced, differential signal for the serial-digital output. The data control word contains all of the information to be transmitted from the 514A-3/4/5 to the receiver-exciter unit.

The control word consists of 32 discrete bits in the format specified below (figure 3) with bit 1 transmitted first and bit 32 transmitted last.

BIT	FUNCTION	DESCRIPTION
1	Key signal	Transmit mode - logic 1 Receive mode - logic 0
2	Vox enable	Enable - logic 1 Disable - logic 0
3 through 5	Squelch level	Bit 3 is the least and bit 5 is the most significant bit. A data value (digit weight) of 0 corresponds to the maximum squelch threshold level and a data value of 6 corresponds to the minimum squelch threshold level. A data value of 7 disables the squelch circuits.
6 through 8	Mode select	Bit 6 is the least and bit 8 is the most significant bit.
9 through 30	Frequency select	Conventional bcd 4-bit coding is used, least significant digit first. The frequency digits are oriented with the least significant digit first (ie, 100 Hz is coded into bits 9 through 12, 1 kHz is coded into bits 13 through 16, etc). The 10-MHz digit is shortened to two bits (bits 29 and 30) since it may assume only the values of 0, 1, or 2.
31	Tune start	Indicates that a frequency setting has been changed. The change condition has a binary weight of logic 1 and is maintained for four to eight consecutive word times after disappearance of the tune start signal. The logic then reverts to the no-change condition which has a binary weight of logic 0.
32	Word sync	Used to frame (ie, identify a known position) the data control word. The binary weight (logic level) of the word sync bit alternates for consecutive word transmissions.



CHARACTERISTIC

PTT KEYING
TRANSMIT
RECEIVER

RESERVED ENABLE
ENABLE
DISABLE

SQUELCH LEVEL
HIGHEST THRESHEQUENCY

WORD
LOWEST THRESH
DISABLE

MODE SELECT
OFF
USB
LSB
AME
CW
SVU
SVL
TEST

TP2-3904-014

Figure 3. Modulo-Two Control Word Format.

All timing signals used by the 514A-3/4/5 are derived from a single source, an astable multivibrator located on A2 and operating at 4800 Hz ±5 percent. The 4800-Hz output of the multivibrator is applied to the timing generator circuit that provides timing (clock) signals throughout the 514A-3/4/5.

Control information, in binary parallel form, is applied from the control switches to a 32-bit parallel-to-serial converter circuit. The serial data output of the converter is applied through a data gate circuit to an exclusive OR circuit where it is combined (modulo-two added) with the 2400-Hz bit clock signal. The output of the exclusive OR circuit forms the serial data control signal that is applied to a line driver stage to provide a dc balanced, differential signal for the serial-digital output. The data control word contains all of the information to be transmitted from the 514A-3/4/5 to the receiver-exciter unit.

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BIT	FUNCTION	DESCRIPTION
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6 through 8	Mode select	Bit 6 is the least and bit 8 is the most significant bit.
9 through 30	Frequency select	Conventional bcd 4-bit coding is used, least significant digit first. The frequency digits are oriented with the least significant digit first (ie, 100 Hz is coded into bits 9 through 12, 1 kHz is coded into bits 13 through 16, etc). The 10-MHz digit is shortened to two bits (bits 29 and 30) since it may assume only the values of 0, 1, or 2.
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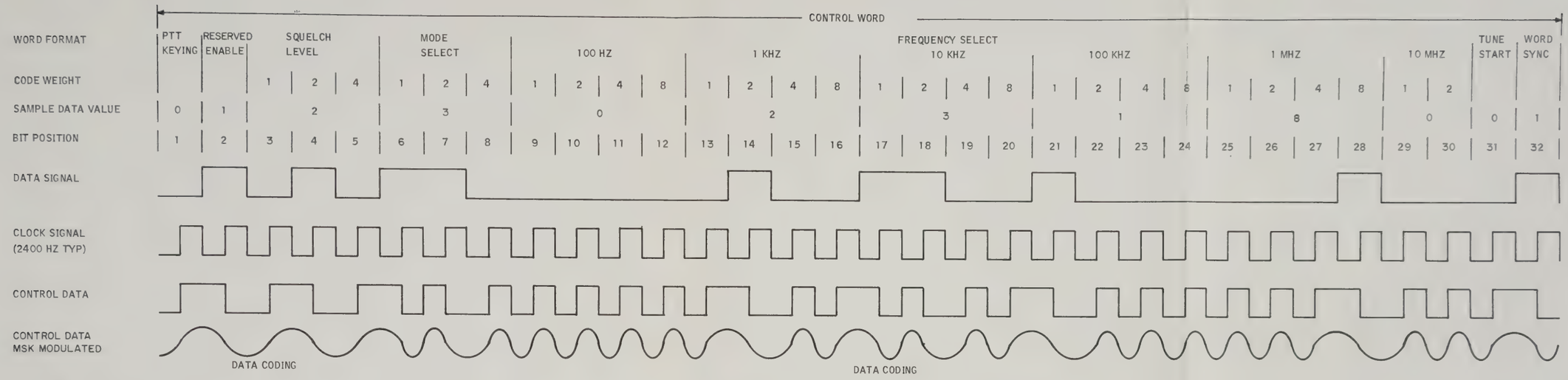
32	Word sync	Used to frame (ie, identify a known position) the data control word. The binary weight (logic level) of the word sync bit alternates for consecutive word transmissions.


CONTROL WORD
WORD FORMAT
PTT KEYING
RESERVED ENABLE
SQUELCH LEVEL
MODE SELECT
100 HZ
1 KHZ
FREQUENCY SELECT
10 KHZ
100 KHZ
1 MHZ
10 MHZ
TUNE START
WORD SYNC
CODE WEIGHT
1 2 4 1 2 4 1 2 4 8 1 2 4 8 1 2 4 8 1 2 4 8 1 2 4 8 1 2
SAMPLE DATA VALUE
0 1 2 3 0 2 3 1 8 0 0 1
BIT POSITION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
DATA SIGNAL
CLOCK SIGNAL
(2400 HZ TYP)
CONTROL DATA
CONTROL DATA
MSK MODULATED
DATA CODING
DATA CODING

CHARACTERISTIC	DATA VALUE
PTT KEYING	
TRANSMIT	1
RECEIVER	0
RESERVED ENABLE	
ENABLE	1
DISABLE	0
SQUELCH LEVEL	
HIGHEST THRESHOLD	0
	1
	2
	3
	4
	5
LOWEST THRESHOLD	6
DISABLE	7
MODE SELECT	
OFF	0
USB	1
LSB	2
AME	3
CW	4
SVU	5
SVL	6
TEST	7

CHARACTERISTIC	DATA VALUE
FREQUENCY SELECT	
100 HZ DIGIT (BITS 9-12)	BINARY CODED DECIMAL
1 KHZ DIGIT (BITS 13-16)	
10 KHZ DIGIT (BITS 17-20)	
100 KHZ DIGIT (BITS 21-24)	
1 MHZ DIGIT (BITS 25-28)	
10 MHZ DIGIT (BITS 29-30)	
TUNE START (BIT 31)	
LOGIC 1	FOR AT LEAST FOUR WORDS AFTER A NEW FREQUENCY IS SELECTED
LOGIC 0	ALL OTHER TIMES
WORD SYNC	
BIT 32	LOGIC LEVEL ALTERNATES EACH SUCCESSIVE WORD

TP2-3904-014

Figure 3. Modulo-Two Control Word Format.

The serial control data signal is the only output from the 514A-3/4/5. The output is a dc-balanced differential signal that operates into a shielded, twisted pair of #22 AWG wires not longer than 500 feet and that is terminated by an impedance of 82 ohms ±10 percent (resistive). The characteristics specified for the signal waveshape are defined in figure 4.

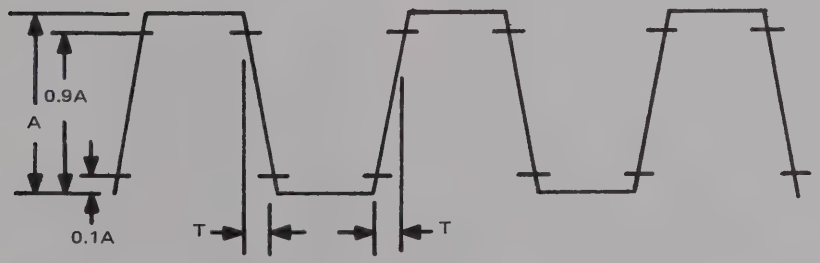
The operational status of the system can be monitored with the RF TEST lamp (fault status) located on the front panel. With the 514A-3/4/5 in the RF TEST mode and the system keyed, the fault monitoring circuits in the receiver-exciter are enabled. If a fault is detected, the RF TEST lamp will be switched on by the receiver-exciter circuits. A steady glow or a flashing indication may be used to indicate a fault in one of the units in the hf system.

5.3 Detailed Theory (Refer to figures 2 and 3 in the diagrams section.)

The control switches located on the front panel of the 514A-3/4/5 provide three functional input signals to the modulo-two transmit card (A2). These control signals are; operating mode, squelch level, and frequency selection. A ptt keying signal or a VOX enable signal may be provided by external control switches presenting high (greater than 100 kΩ) or low (less than 100 ohms) resistances to ground on individual lines to the 514A-3/4/5 rear connector. See figure 2 for connector pin information.

The frequency, mode, and squelch level signals are switched connections to ground developed by the control switches on the front panel. The status of each switch contact is tested by a sensing circuit that has an open circuit voltage of +5.0 ±0.5 Vdc (referenced to ground) and a source impedance of 3900 ohms ±10 percent.

The frequency signal consists of 23 input lines representing five full binary coded decimal digits, one abbreviated binary coded decimal digit, and an initiate (tune start) signal. The initiate signal is a momentary switch closure to ground which occurs whenever any frequency selection switch is moved from a detented position.



A = 3.5 ± 1.5 VOLTS
T = 7.5 ± 2.5 MICROSECONDS
SIGNAL DURATION DEPENDS UPON THE DATA.

TP2-4656-011

Figure 4. Output Signal Waveform.

The mode signal consists of three input lines that code eight possible operating mode selections (figure 3). The mode selection switch has shorting type switch contacts.

The squelch signal consists of three input lines which code eight possible squelch level settings (figure 3).

The ptt keying signal and the VOX enable signal are each a single line input signal developed externally; these may be either a switch contact closure or a saturated transistor-type switch closure to ground. Impedance for the closed switch condition shall not exceed 100 ohms, and for an open switch condition shall be not less than 100 kΩ. The keying signal and VOX enable signal are sensed by circuits having an open circuit voltage of +5.0 Vdc, +0.335 Vdc and -0.5 Vdc (referenced to ground) and a source impedance of 3900 ohms ±10 percent. Overvoltage protection is provided by 5.1-volt zeners (VR1 and VR2) on modulo-two transmit card A2.

The modulo-two transmit card A2 interfaces the 514A-3/4/5 controls with the modulo-two receive assembly in a remotely located receiver-exciter. Card A2 accepts all of its input signals in parallel, develops the control data word from these inputs and transmits the control word in serial bit mode to the receiver-exciter.

All internal timing signals required by A2 are derived from the 4800-Hz astable multivibrator Q1 and Q2. The output of the multivibrator is routed through logic inverters U5C and U5D and applied to the timing generator circuit (U6 and U1). The timing generator circuit is basically two divide-by-16 binary counters connected in series. By divider action the timing generator develops the 2400-Hz clock signal plus seven difference timing signals. Each timing signal has a specific binary weight, WT1, WT2, WT4, WT8, WT16, WT32 and WT64 (figure 5). Timing signals WT1, WT2, and WT4 from counter U6 are applied to pins 11, 12, and 13 of the four 8-bit multiplexers U2, U7, U4, and U9. The WT4 signal is also applied to the clock input of the second counter U1. An enable signal, timing signal WT8, is applied directly to pin 10 of multiplexers U2 and U7: simultaneously, timing signal WT8 is inverted through logic gate U5A and applied to pin 10 of multiplexers U4 and U9. Only two multiplexers are enabled at any given time (U2 and U7 or U4 and U9). Timing signal WT16 from U1 in both direct and inverted states is applied to data gate circuit U11, so that either logic gates A and B or C and D will be enabled at any given time. Timing signal WT32 is applied to pin 9 of multiplexer U9 and timing signal WT64 is used as the clock signal for the initiate tuning signal delay circuit (U3).

Selected control information (key enable, squelch level, operating mode, and frequency selection) is applied in inverted form to the appropriate multiplexer. The output signal from the multiplexers (pin 15), along with the WT16 timing signal, is applied to the data gate circuit (U11). Data gate U11 allows only the appropriate control data (determined by the timing signals) to be routed to the exclusive OR circuit where it is modulo-two added with the 2400-Hz clock signal from the timing generator circuit. For example; operating mode control information is encloded in bits 6, 7, and 8. Assume a time period in which multiplexers U2 and U7 are enabled, U4 and U9 are disabled, logic gates C and D of U11 are enabled, and logic gates A and B of U11 are disabled. Only the output (mode selection) of U2 is passed through data gate U11 to the exclusive OR circuit (U5B, U5E, U8A, and U8B).

The serial control data and the 2400-Hz clock signal are simultaneously applied in both direct and inverted state to logic gates U8A and U8B. When the serial control data and 2400-Hz clock signal are in phase, (both logic 1 or logic 0) the outputs of U8A and U8B will be inverted from each other (see figure 3) applying a logic 1 and a logic 0 to input pins 1 and 2 of line driver U10A. When the serial control data and 2400-Hz clock signal are out of phase, the outputs of U8A and U8B will be a logic 1, applying a logic 1 to input pins 1 and 2 of line driver U10A. When the inputs to U10A are all logic 1 the data output signal will be a logic 0 for output A and a logic 1 for output B; when a logic 0 is applied to pin 1 or 2 of U10A, indicating an out-of-phase condition, the data output signal will be logic 1 for output A and logic 0 for output B.

The tune-start signal in bit-31 position is normally transmitted as logic 0. When a frequency

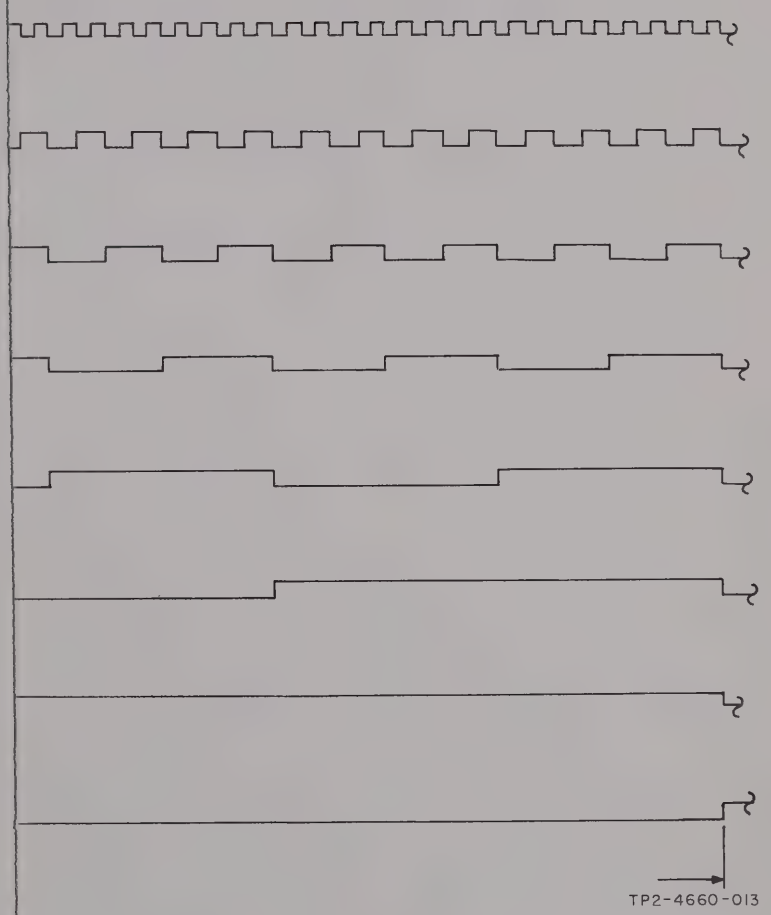


Figure 5. Modulo-Two Transmit Card A2 Timing Signals.

The mode signal consists of three input lines that code eight possible operating mode selections (figure 3). The mode selection switch has shorting type switch contacts.

The squelch signal consists of three input lines which code eight possible squelch level settings (figure 3).

The ptt keying signal and the VOX enable signal are each a single line input signal developed externally; these may be either a switch contact closure or a saturated transistor-type switch closure to ground. Impedance for the closed switch condition shall not exceed 100 ohms, and for an open switch condition shall be not less than 100 kΩ. The keying signal and VOX enable signal are sensed by circuits having an open circuit voltage of +5.0 Vdc, +0.335 Vdc and -0.5 Vdc (referenced to ground) and a source impedance of 3900 ohms ±10 percent. Overvoltage protection is provided by 5.1-volt zeners (VR1 and VR2) on modulo-two transmit card A2.

The modulo-two transmit card A2 interfaces the 514A-3/4/5 controls with the modulo-two receive assembly in a remotely located receiver-exciter. Card A2 accepts all of its input signals in parallel, develops the control data word from these inputs and transmits the control word in serial bit mode to the receiver-exciter.

All internal timing signals required by A2 are derived from the 4800-Hz astable multivibrator Q1 and Q2. The output of the multivibrator is routed through logic inverters U5C and U5D and applied to the timing generator circuit (U6 and U1). The timing generator circuit is basically two divide-by-16 binary counters connected in series. By divider action the timing generator develops the 2400-Hz clock signal plus seven difference timing signals. Each timing signal has a specific binary weight, WT1, WT2, WT4, WT8, WT16, WT32 and WT64 (figure 5). Timing signals WT1, WT2, and WT4 from counter U6 are applied to pins 11, 12, and 13 of the four 8-bit multiplexers U2, U7, U4, and U9. The WT4 signal is also applied to the clock input of the second counter U1. An enable signal, timing signal WT8, is applied directly to pin 10 of multiplexers U2 and U7: simultaneously, timing signal WT8 is inverted through logic gate U5A and applied to pin 10 of multiplexers U4 and U9. Only two multiplexers are enabled at any given time (U2 and U7 or U4 and U9). Timing signal WT16 from U1 in both direct and inverted states is applied to data gate circuit U11, so that either logic gates A and B or C and D will be enabled at any given time. Timing signal WT32 is applied to pin 9 of multiplexer U9 and timing signal WT64 is used as the clock signal for the initiate tuning signal delay circuit (U3).

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The tune-start signal in bit-31 position is normally transmitted as logic 0. When a frequency

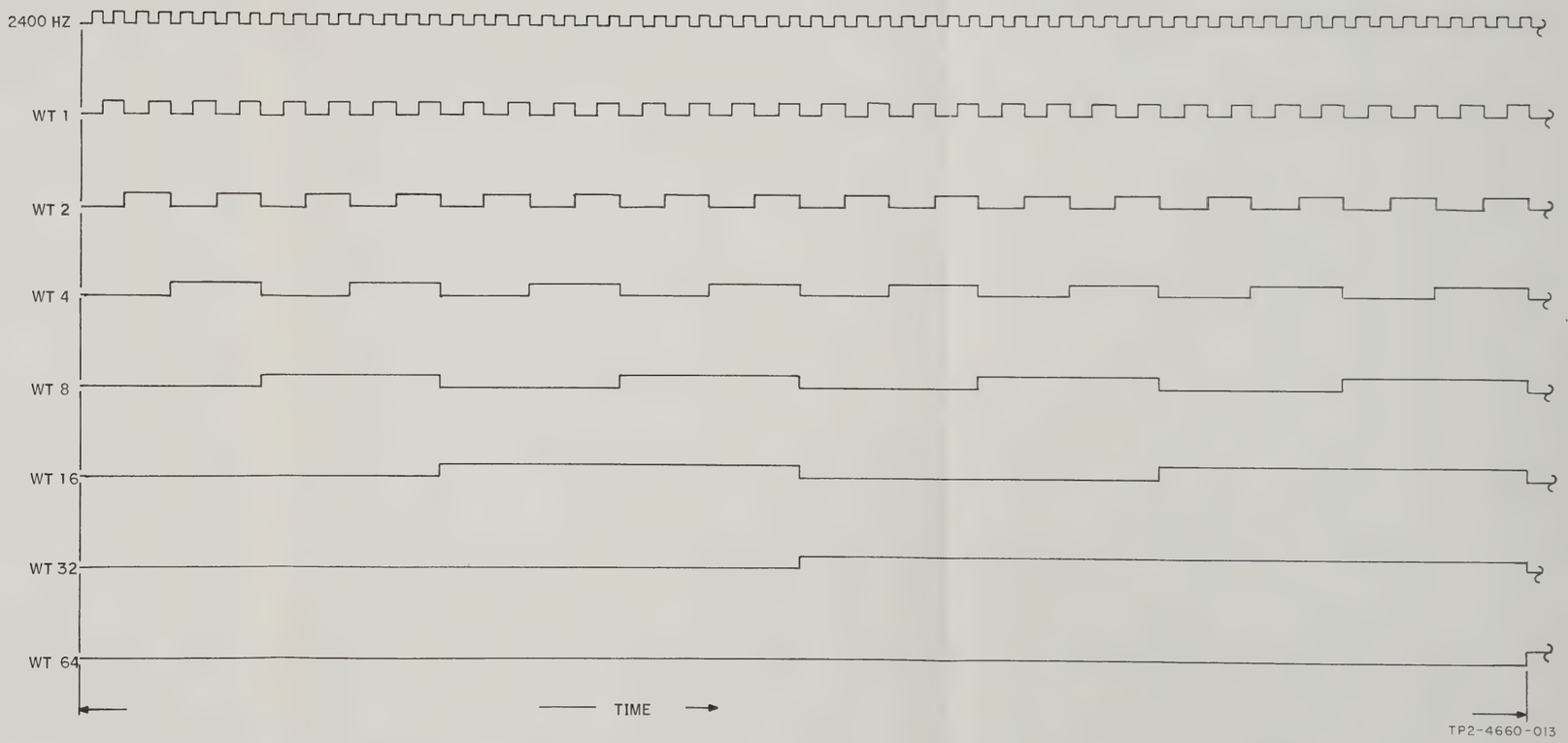

Figure 5. Modulo-Two Transmit Card A2 Timing Signals.

change is initiated, the tune-start signal is transmitted as logic 1 for four to eight successive control words to indicate that a frequency change has occurred. Turning any frequency switch supplies a momentary ground to the set terminals of U3A and U3B. This sets the false output of U3B to logic 0 which is applied to pin 7 of U9. Multiplexer U9 will insert this signal into the bit-31 position in the control word. Data gate U11 inverts the data and causes a logic 1 to be transmitted in bit-31 position as long as pin 7 of U9 is at logic 0. When the ground is removed from pins 14 and 8 of U3A and U3B, two negative-going transitions of the WT64 timing signal supplied to U3A clock input (TP1) must occur before the output at pin 11 of U3B changes back to its normal state of logic 1 which causes bit 31 to return to logic 0.

The +15- to +5-Vdc dc converter A3 receives a continuous +15 Vdc from the receiver-exciter, converts it to +5 Vdc, and applies it to pins 41 and 42 of P1 on the modulo-two transmit card (A2).

6. DIFFERENCE DATA

The 514A-3 and 514A-5 Radio Set Control units are identical except for the type connector used for rear i/o connector J1 and the wiring to J1. See the outline and mounting dimensions diagram (figure 1 in the diagrams section) for the nomenclature of each connector. Refer to the radio set control schematic diagram (figure 2 in the diagrams section) for the chassis wiring information for each control. There are three types of 514A-4 Radio Set Controls, Collins part numbers 792-6122-001, 792-6122-002, and 792-6122-003. The differences between these types are shown in table 1. The rear i/o connector information, like the 514A-3 and 514A-5, is shown in figure 1 in the diagrams section.

Table 1. 514A-4 Difference Data.

514A-4 COLLINS PART NUMBER	28-VOLT PANEL LIGHTS	5-VOLT PANEL LIGHTS	USB, LSB, AM, CW, SVU, SVL, RF TEST MODES	USB, LSB, AM, RF TEST MODES ONLY
792-6122-001	X		X	
792-6122-002		X	X	
792-6122-003		X		X

514A-3/4/5 Radio Set Control

COLLINS

operation

Printed in U.S.A

523-0762550-002118
2nd Edition, 15 December 1971

table of contents

Paragraph		*Page*
1.	*General*	1
2.	*Controls and Indicators*	1
3.	*Operating Procedures*	1
3.1	General	1
3.2	Voice Operation	1
3.3	CW Operation	2
3.4	Narrow-Band Secure Voice Operation	3
3.5	Fault Clearing Procedures	3

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NOTICE: This section replaces first edition dated 15 June 1970.

List of Effective Pages

*The asterisk indicates pages changed, added, or deleted by the current change.

Page No	Issue
*Tab Divider	15 Dec 71
*Title	15 Dec 71
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*1 thru 4	15 Dec 71

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1. GENERAL

This section presents procedures of operation for an hf airborne communication system (such as the 718U-4A) using the 514A-3/4/5 Radio Set Control.

2. CONTROLS AND INDICATORS

All controls and indicators are located on the front panel of the 514A-3/4/5 Radio Set Control. Control and indicator functions and descriptions are listed in table 1, and the locations are shown in figure 1.

3. OPERATING PROCEDURES

3.1 General

The operating procedures contained in this section are those procedures necessary to control and operate a typical airborne hf communication system using the 514A-3/4/5 Radio Set Control.

3.2 Voice Operation

Procedures for voice operation are as follows:

a. Tune mode selector to desired operating voice mode (USB, LSB, or AM).
b. Set frequency selector knobs to the desired operating frequency.

Table 1. Control and Indicator Functions.

CONTROL/INDICATOR	FUNCTION
MHz select control	Selects desired MHz increments for transceiver operation.
100-kHz select control	Selects desired 100-kHz increments for transceiver operation.
10-kHz select control	Selects desired 10-kHz increments for transceiver operation.
1-kHz select control	Selects desired 1-kHz increments for transceiver operation.
100-Hz select control	Selects desired 100-Hz increments for transceiver operation.
Mode select control	Selects desired operational mode: OFF, USB, LSB, AM, CW, SVU, or SVL. Also provides RF TEST position for checking equipment. **Note** 514A-4, Collins part number 792-6122-003 does not have CW, SVU, and SVL modes.
SQL control	Adjusts the threshold level in the audio squelch circuit of the transceiver in all operational modes.
RF TEST lamp	Indicates the operational status of the hf system when the 514A-3/4/5 is in the RF TEST mode and the hf system is keyed.

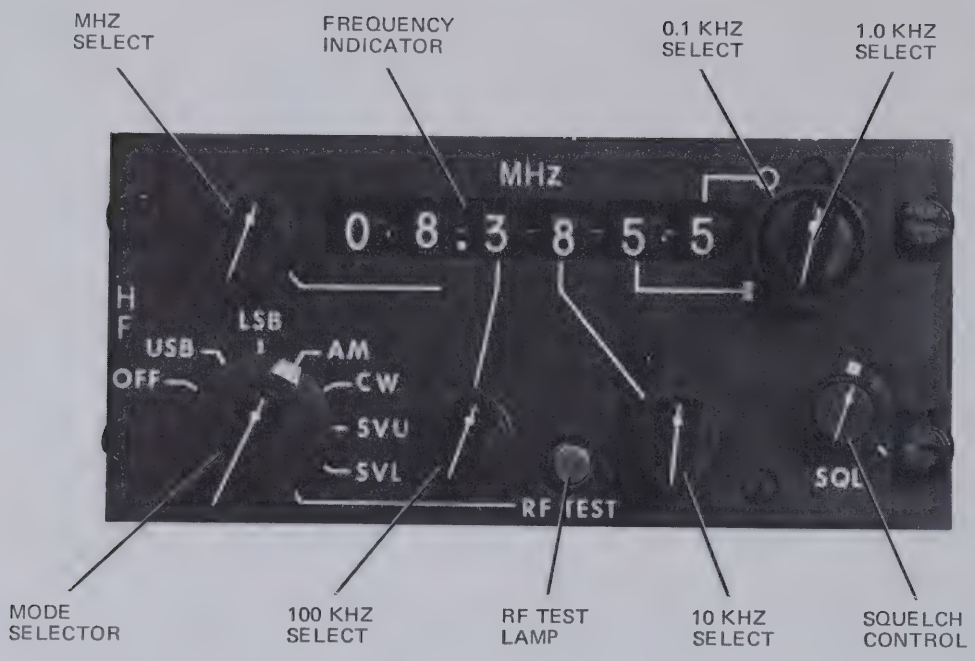

Figure 1. Controls and Indicator Locations.

Note

Squelch level must be readjusted at each frequency setting.

c. If squelch operation is desired, adjust squelch control counterclockwise to a point where background noise just disappears. Turn the squelch control clockwise until the background noise is heard in the receiver output, and then move the control one position counterclockwise to set the squelch threshold.

d. Tune the system by depressing the push-to-talk switch momentarily after tube filament time delay is complete. The system will then tune automatically. A constant tone will be heard in the earphones or speaker during the tune cycle. The average tune cycle is 5 to 10 seconds. After completion of the tune cycle, the constant tone will disappear.

Note

If the tone fails to disappear after the approximate tune time has elapsed, or if an interrupted tone (beep) is heard in the earphones or speaker, a system fault is indicated. The control unit RF TEST lamp burning steadily or blinking also indicates a system fault if the 514A-3/4/5 is in the RF TEST mode and the hf system is keyed. Refer to paragraph 3.5 (fault clearing procedures).

e. If step d is completed with no fault indication, voice transmissions may be made using the microphone (ptt). The presence of sidetone in the earphones or speaker is an indication of transmitter output during transmit operation.

Note

The lack of sidetone is an indication of transmit signal failure. If this occurs, refer to the appropriate system instruction book.

3.3 CW Operation

The procedures for CW operation, for all units except 514A-4 Collins part number 792-6122-003, are as follows:

a. Turn mode switch to CW position.
b. Set the frequency selector knobs to the desired operating frequency.
c. Turn squelch control to the clockwise stop position.
d. Tune the system by pressing either CW key or push-to-talk switch momentarily. A constant tone will be heard in the earphone or speaker during the tune cycle (approximately 5 to 10 seconds).

Note

If the tune tone fails to disappear or if an interrupted tone (beep) is heard, a system fault is indicated. The control RF TEST lamp burning steadily or blinking, if the 514A-3/4/5 is in the RF TEST mode and the hf system is keyed, also indicates a system fault. Refer to paragraph 3.5 (fault clearing procedures).

e. If step d is completed with no fault indication, CW transmission may be made. The presence of sidetone in the headset or handset is an indication of transmitter output during transmit operation.

Note

The lack of sidetone is an indication of transmit signal failure. If this occurs refer to the appropriate system instruction book.

3.4 Narrow-Band Secure Voice Operation

The procedures for narrow-band secure voice operation, for all units except 514A-4 Collins part number 792-6122-003, are as follows:

a. Turn mode switch to SVU (narrow-band secure voice, upper sideband) or SVL (narrow-band secure voice, lower sideband) position.
b. Set the frequency selector knobs to the desired operating frequency.
c. Tune and operate the system in the same manner as for normal voice operation, except use the handset on the vocoder in place of the normal audio microphone.

3.5 Fault Clearing Procedures

To check for a visual fault indication, set the control unit mode selector to RF TEST. Set frequency controls to an assigned transmit frequency and key the system. Allow approximately 10 seconds for system to tune. With the system manually keyed observe the RF TEST lamp on the control unit for the following indications:

Burning steadily.....	Receiver-exciter unit fault indication.
Blinking.....	Power amplifier, pa power supply, or antenna coupler fault indication.
Out.....	System normal.

A system fault may also be detected by audible means. After the tune cycle has been completed, the normal tune tone should disappear in the headset or speaker. Failure of the steady tone to disappear indicates a fault condition in either the power amplifier or the power amplifier power supply. An interrupted tone (beeping) appearing in the headset or speaker approximately 10 seconds after the tune cycle is initiated indicates a fault condition in the antenna coupler system.

Note

An antenna coupler fault condition (indicated by the beeping tone) forces the hf system to an unkeyed condition, even though the push-to-talk switch is pressed, and invalidates the indications of the RF TEST lamp.

To clear a system fault and initiate a new tune cycle, move one of the frequency digits on the radio set control off frequency, and then reset this digit to the desired frequency. This action homes the tuning elements in both the power amplifier and antenna coupler, permitting the initiation of a new tune cycle. The new tune cycle is initiated by pressing the push-to-talk switch (or CW key). Tune tone will appear in headset or speaker and disappear after tuning

sequence is completed. If the steady/interrupted tone is still present, the clearing procedure should be tried a second time. If this fails to clear the fault, an equipment failure is indicated; refer to the appropriate system instruction book.

Note

Should a fault tone appear at any time during normal operation, the fault clearing procedures outlined above should be followed.

COLLINS

514A-3/4/5 Radio Set Control

maintenance

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table of contents

Paragraph		Page
1.	***General***	1
2.	***Test Equipment and Power Requirements***	1
2.1	Test Equipment	1
2.2	Power Requirements	1
3.	***Testing***	9
3.1	General	9
3.2	Test Setup	9
3.3	Performance Tests	9
4.	***Troubleshooting***	9
5.	***Disassembly/Assembly***	9
5.1	Disassembly	9
5.2	Assembly	9
6.	***Repair***	22
6.1	Replacement of Faulty Contact Brush Assembly	22
6.2	Repair or Replacement of Faulty Frequency Switch Detent	23
7.	***Adjustments***	23
7.1	Counter Wheel Alignment	23
7.2	Mode Switch Alignment	23

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*7	15 Dec 71
8 Blank	1 Aug 70
*9 thru 22	15 Dec 71
*23 thru 24 Added	15 Dec 71

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1. GENERAL

This section contains maintenance instructions for the 514A-3/4/5 Radio Set Control. Included are the necessary data and procedures required to check out and troubleshoot the 514A-3/4/5.

2. TEST EQUIPMENT AND POWER REQUIREMENTS

2.1 Test Equipment

Test equipment required to maintain the 514A-3/4/5 is listed in table 1. If items listed are not available, equivalent test equipment may be used.

A special test fixture also is required to test the 514A-3/4/5. Figure 1 shows the suggested front panel layout and figure 2 is the schematic diagram of the test fixture. Table 2 lists the parts necessary to fabricate the test fixture.

2.2 Power Requirements

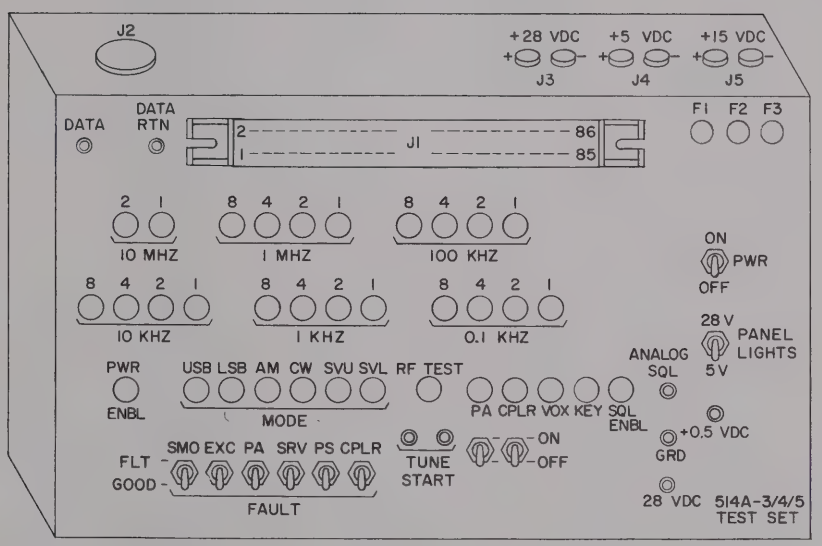
The following power is required to test the 514A-3/4/5: 28 ±1 Vdc at 0.5 A; +15 ±0.3 Vdc at 0.5 A, ripple NMT 150 mV peak to peak; +5 ±0.1 Vdc at 0.5 A, ripple NMT 150 mV peak to peak.

Table 1. Test Equipment Required.

TEST EQUIPMENT	MANUFACTURER TYPE AND/OR PART NUMBER	REQUIRED CHARACTERISTICS
Oscilloscope	Tektronix 454	Frequency measurement 0 to 4800 Hz/11-ns rise time
		Voltage measurement 0 to +5 Vdc
Multimeter	Triplett 630NA	Resistance measurement 0 to 400 ohms
		Voltage measurement 0 to 28 Vdc
Dc digital voltmeter	Fairchild 7000-02	Voltage measurement 0 to 15 Vdc
Test fixture	Fabricate	Na
Dc power supply	Kepco ABC40-05M	28 ±1 Vdc at 0.5 A
Dc power supply (2)	Kepco ABC18-05M	Variable 0 to +15 ±0.3 Vdc at 0.5 A, ripple NMT 150 mV p-p

Table 2. Special Test Fixture Parts List.

SYMBOL (QTY)	DESCRIPTION	MANUFACTURER TYPE AND/OR COLLINS PART NUMBER
DS1 through DS35 (35)	Lamp, incandescent, 28 Vdc Base/lens assembly	Collins part no 262-0179-010 Collins part no 262-2828-050
J1	Connector	Collins part no 767-8641-001
J2	Connector	Bendix Pigmy Type PT02A-20-39P/ Collins part no 371-2363-00
J3	Connector	Collins part no 372-2240-010
J4	Connector	Same as J3
J5	Connector	Same as J3
P1	Connector	Bendix Pigmy Type PT06A-20-39S(SR)/ Collins part no 371-6204-000
P2	Connector	Bendix Pigmy Type PT06A-20-39S/ Collins part no 371-6204-000
P3	Connector	MS3106A-28-15S/Collins part no 357-4065-00
P4	Connector	Bendix PB06A-22-55S/Collins part no 371-1256-00
Q1 through Q30 (30)	Transistor	2N2222A/Collins part no 352-0661-020
R1 through R29 (29)	Resistor, fixed, 2 kΩ ±10%, 1/4 watt	RCR07G202KS, Collins part no 745-0761-00
R30 through R35 (6)	Resistor, fixed, 4.7 kΩ ±10%, 1/4 watt	RCR07G472KS, Collins part no 745-0773-00
R36	Resistor, fixed 909 ohms ±1%	RN60D9090F, Collins part no 705-6594-00
R37	Resistor, fixed 4.99 kΩ ±5%	RN60D4991F, Collins part no 705-3602-240
S1	Switch, toggle: 4pst	Collins part no 266-5346-000
S2	Switch, toggle: dpdt	MS75029-23, Collins part no 266-5393-090
S3 through S10 (8)	Switch, toggle: spst	MS75028-22, Collins part no 266-5393-020
TP1 through TP7 (7)	Tip jack	MS16108-5A, Collins part no 360-0153-00
F1 and F2 (2)	Fuse, 1 A	Collins part no 264-0928-020
F3	Fuse, 0.75 A	Collins part no 264-0928-010
XF1, 2, and 3 (3)	Fuseholder	Collins part no 265-1171-000
A1	Modulo-two receiver circuit card (671U-4A Receiver-Exciter)	Collins part no 793-9266-001
No symbol	Circuit card bracket	Collins part no 139-0741-070
No symbol	Circuit card guide (p/o circuit card bracket)	Collins part no 139-0741-030



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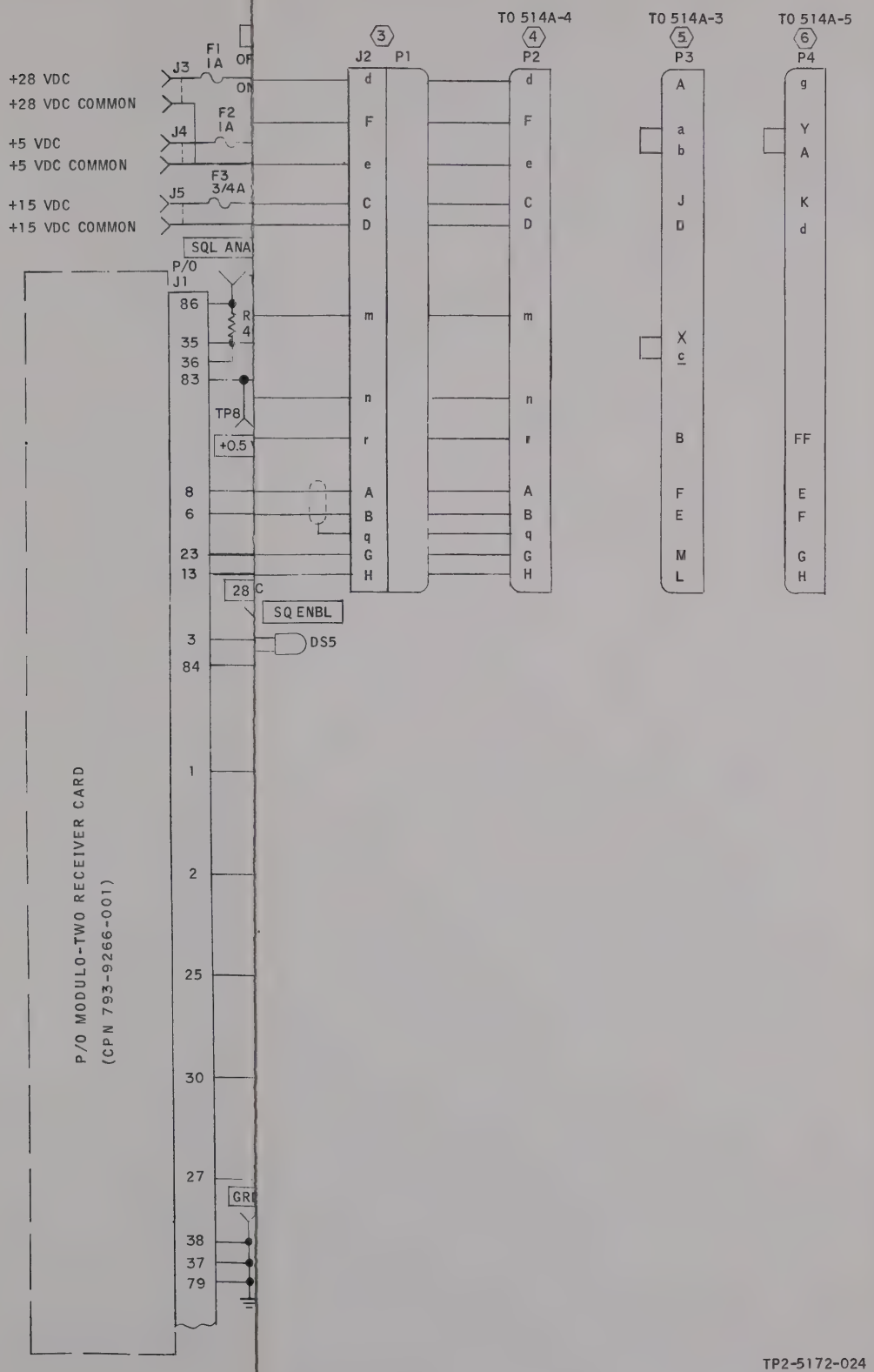
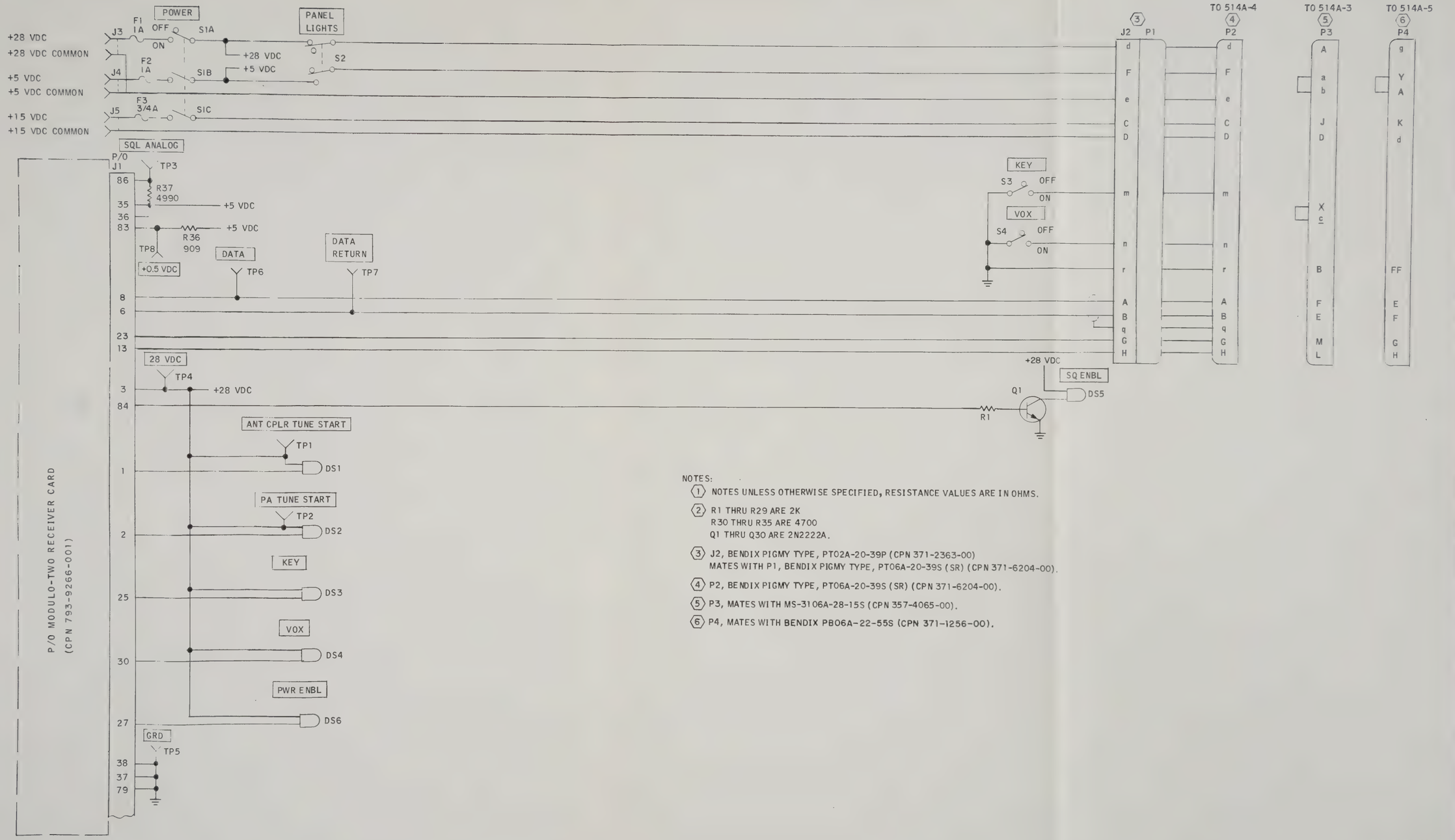
Special Test Fixture, Front Panel Layout
Figure 1



Special Test Fixture, Schematic Diagram
Figure 2 (Sheet 1 of 2)



NOTES:

1. NOTES UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS.
2. R1 THRU R29 ARE 2K
   R30 THRU R35 ARE 4700
   Q1 THRU Q30 ARE 2N2222A.
3. J2, BENDIX PIGMY TYPE, PT02A-20-39P (CPN 371-2363-00)
   MATES WITH P1, BENDIX PIGMY TYPE, PT06A-20-39S (SR) (CPN 371-6204-00).
4. P2, BENDIX PIGMY TYPE, PT06A-20-39S (SR) (CPN 371-6204-00).
5. P3, MATES WITH MS-3106A-28-15S (CPN 357-4065-00).
6. P4, MATES WITH BENDIX PB06A-22-55S (CPN 371-1256-00).

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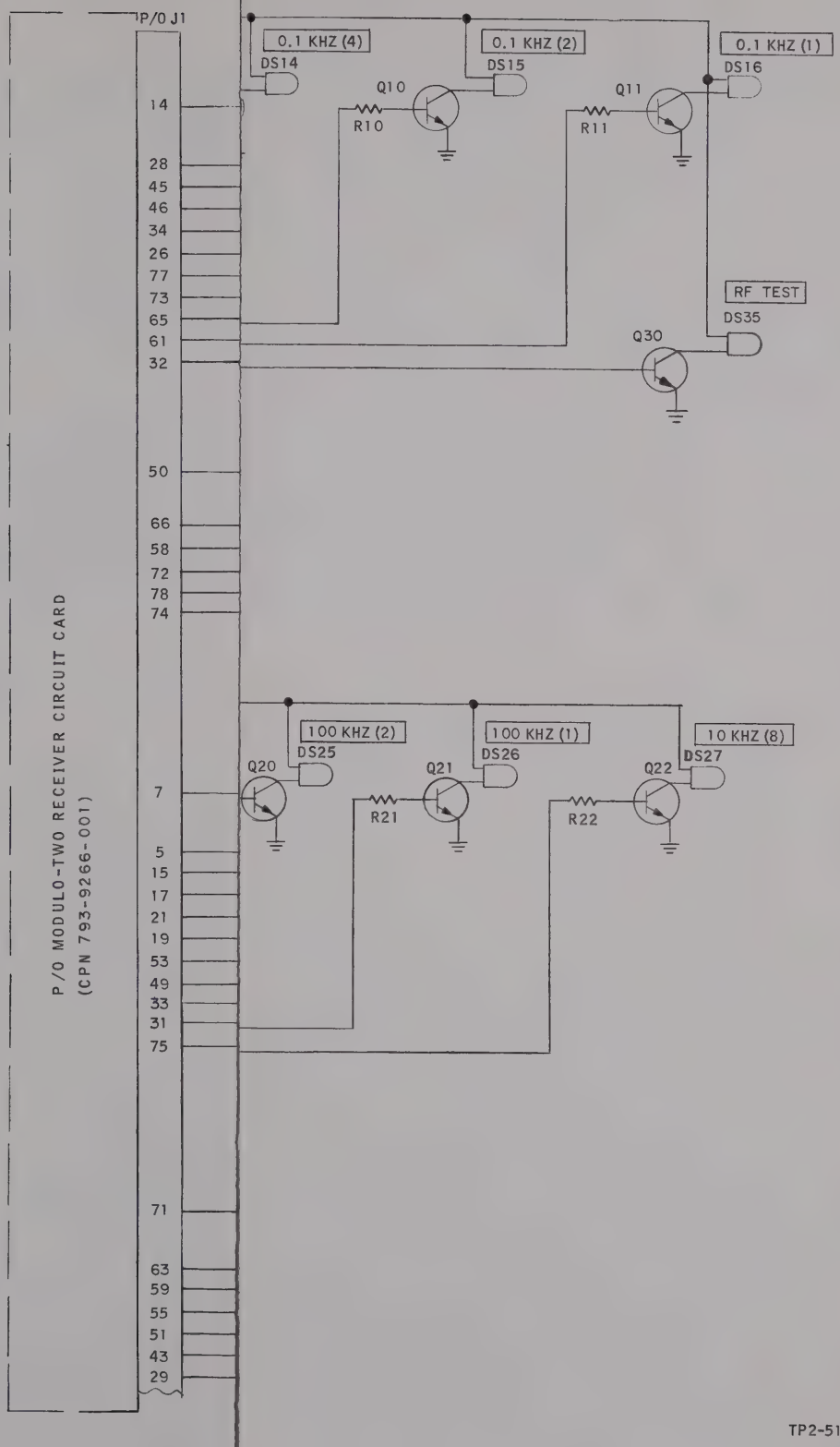
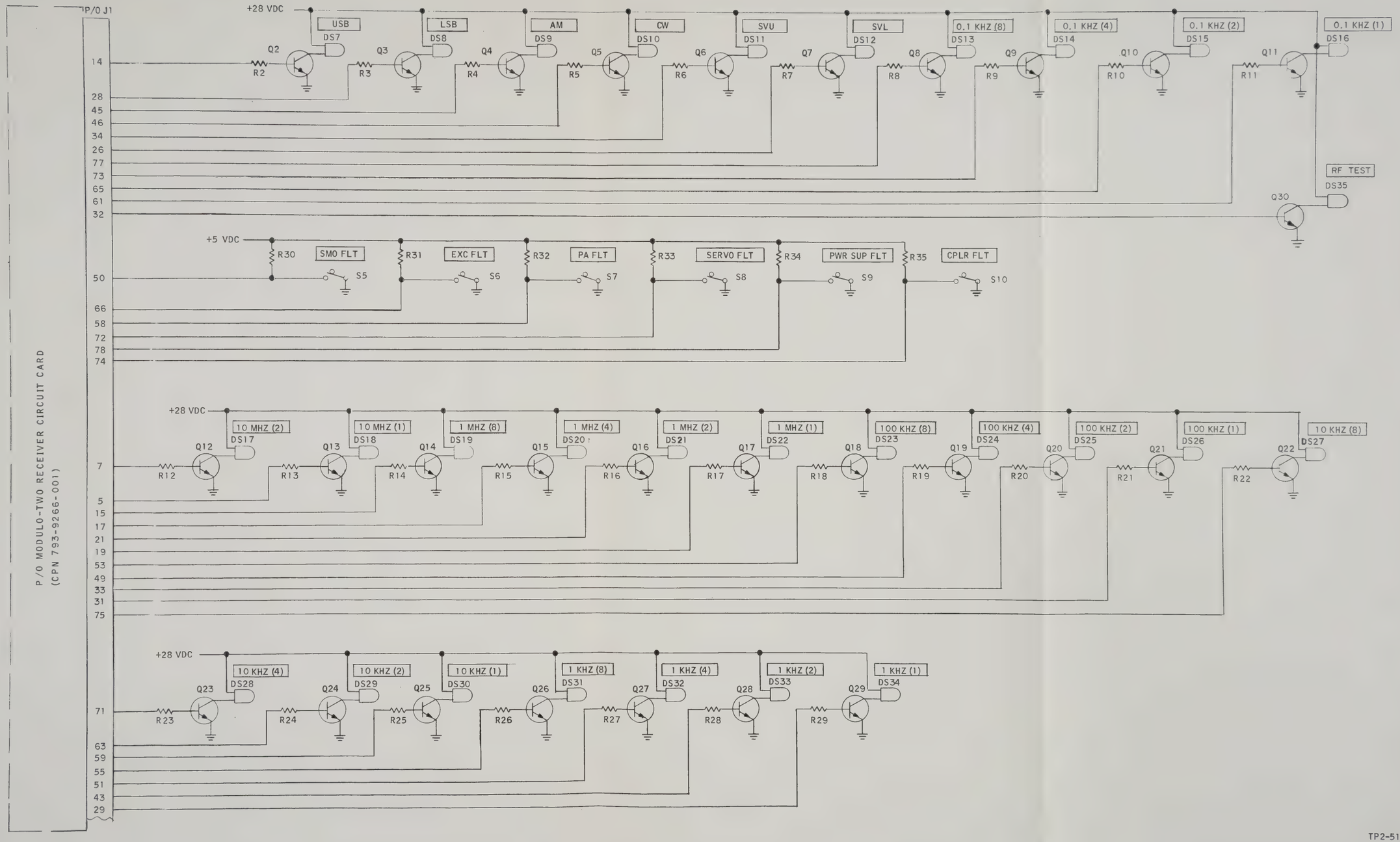
Special Test Fixture, Schematic Diagram
Figure 2 (Sheet 1 of 2)



Special Test Fixture, Schematic Diagram
Figure 2 (Sheet 2 of 2)



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Special Test Fixture, Schematic Diagram
Figure 2 (Sheet 2 of 2)

3. TESTING

3.1 General

The following paragraphs contain information on test setups and performance test procedures. Refer to figure 3 for location of subassemblies and test points.

3.2 Test Setup

The test setup shown in figure 4 is used for both performance tests and troubleshooting.

3.3 Performance Tests

The performance tests outlined in table 3 determine the overall operational quality of the 514A-3/4/5 and should be performed after the equipment has been repaired or if some degradation of performance is suspected. Perform the procedures in the sequence given.

4. TROUBLESHOOTING

Troubleshooting procedures for isolating a malfunction in the 514A-3/4/5 are given in table 4. Whenever a malfunction is located, repair the trouble as directed in paragraphs 5 (disassembly/assembly) and 6 (repair). After repair, perform the performance test procedures (table 3) to ensure that the 514A-3/4/5 meets operational requirements. For location of test points and connectors, refer to figure 3.

Note

To perform continuity checks on the 514A-3/4/5 chassis wiring, it may be necessary to disconnect unit from the test setup and remove subassemblies and/or components to gain access to test points. Unless otherwise noted, use a standard multimeter to conduct voltage, resistance, and continuity checks. Unless otherwise noted when measuring dc resistance, 3 kΩ or greater is considered a high dc resistance. Refer to paragraph 5 for disassembly procedures and the diagrams section of this instruction book for the necessary schematic diagrams.

For the 514A-3/4/5 rear connector pin identification and function, refer to the 514A-3/4/5 schematic diagram (figure 2) in the diagrams section.

5. DISASSEMBLY/ASSEMBLY

5.1 Disassembly

Loosen the two Dzus fasteners holding the 514A-3/4/5 cover in place and remove cover. All internal subassemblies of the 514A-3/4/5 are now accessible should any further disassembly be required. Refer to figure 3 for subassembly/component identification.

To remove modulo-two transmit card A2 from the 514A-3/4/5 chassis, remove four screws securing the card to the chassis. Carefully unplug the card and remove it from the bottom side of the chassis.

To remove dc-to-dc converter A3, unsolder leads from E13, E14, E15, and E16 and remove the three retaining screws securing the assembly to the 514A-3/4/5 chassis.

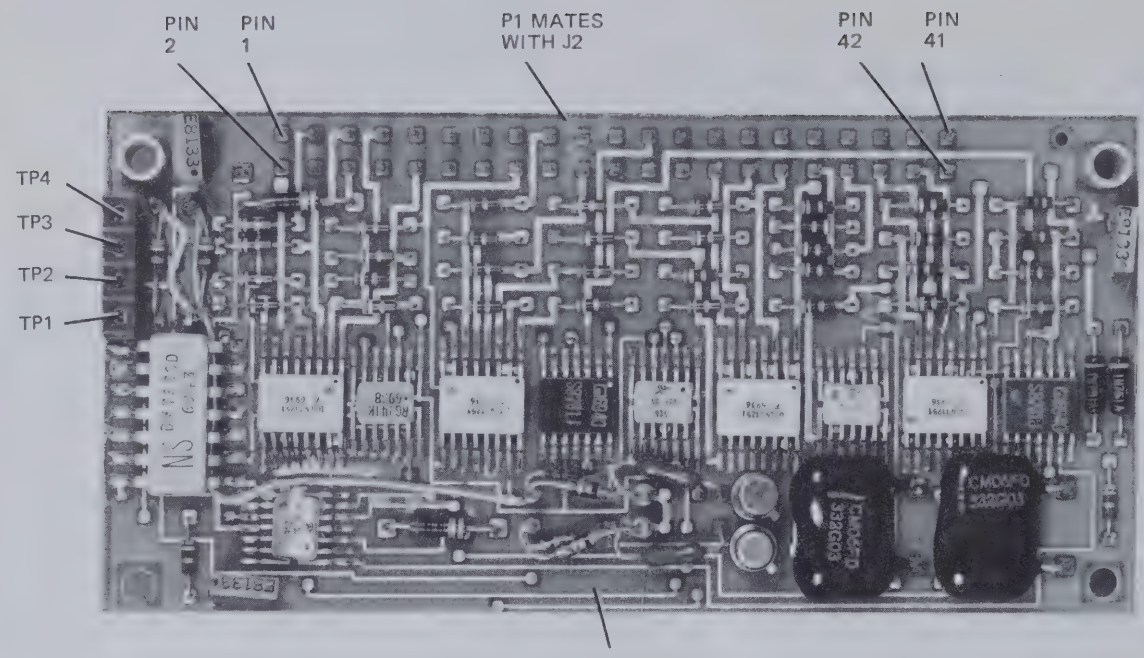
To remove the front panel assembly to gain access to the control switches, remove the six screws securing the panel to the 514A-3/4/5 chassis and pull panel away from the chassis. Refer to the 514A-3/4/5 exploded view (figure 1 in the parts list section) as necessary.

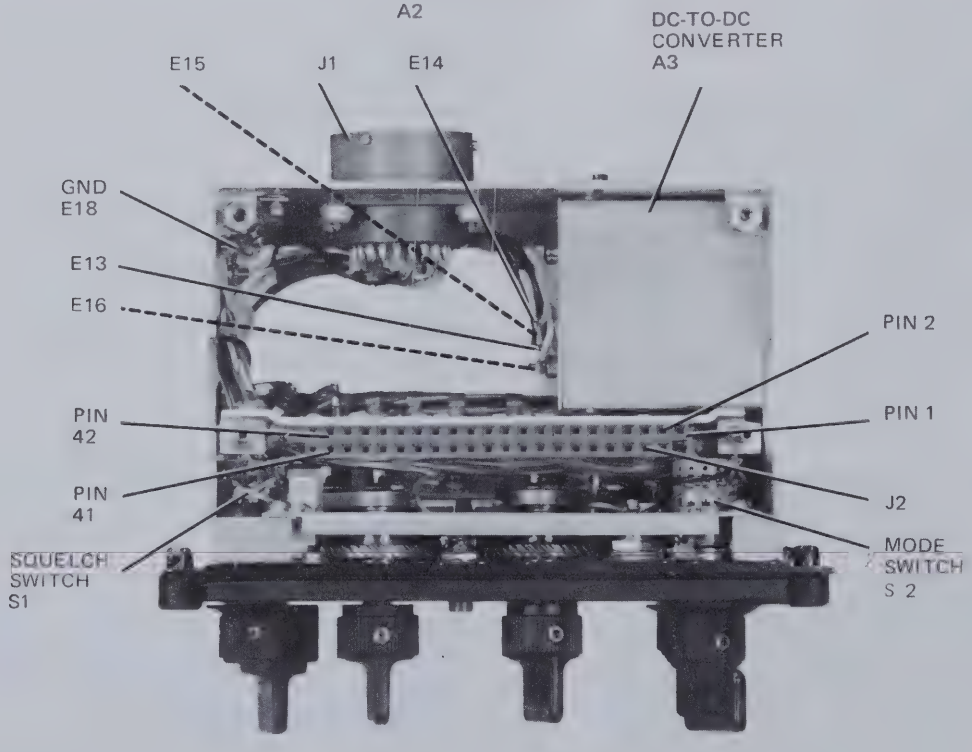
To remove the edge-lighted front panel, remove all control knobs and the two screws securing the lighting panel to the front panel, and remove the lighting panel.

If disassembly of the mode, squelch, or frequency control switches are required, refer to the 514A-3/4/5 exploded views (figures 1 and 2 in the parts list section).

5.2 Assembly

Perform assembly procedures in the reverse order of disassembly.





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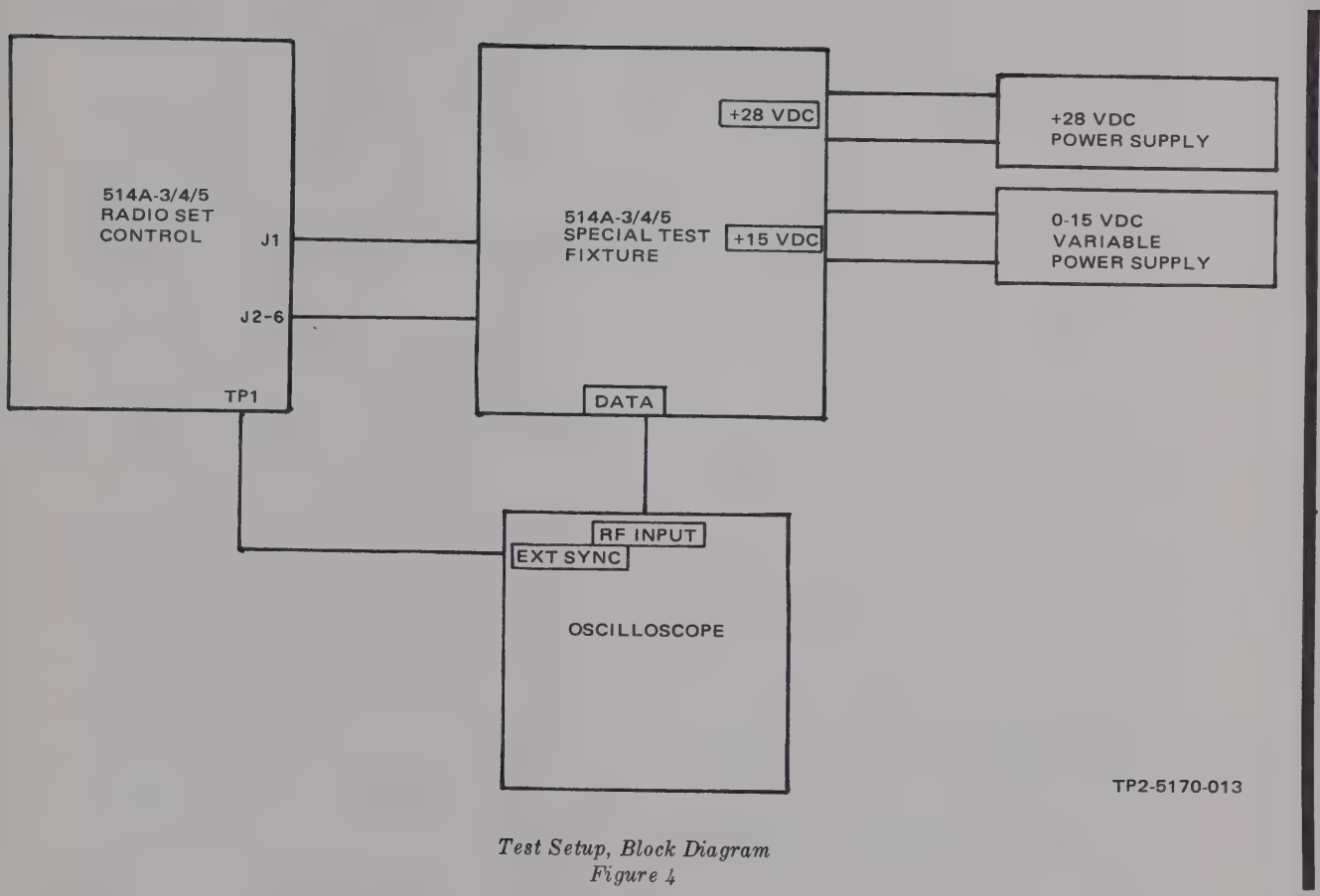
Test Point Locations
Figure 3



Test Setup, Block Diagram
Figure 4

Table 3. Performance Test Procedures.

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
	PRELIMINARY TESTS		
1	Remove 514A-3/4/5 cover and visually check for proper assembly, loose or broken wire, and burned or missing components.		
2	With multimeter, measure the dc resistance between the following pins on the 514A-3/4/5 rear connector (J1). Place the multimeter lead, which has positive voltage, on the pin indicated as positive.		Refer to table 4, step 2.
	Note		
	The common lead is positive on some multimeters.		
	514A-3 J1-J (positive) to J1-D	NLT 400 ohms.	
	514A-4 J1-C (positive) to J1-D	NLT 400 ohms.	
	514A-5 J1-K (positive) to J1-d	NLT 400 ohms.	
3	With multimeter, measure the dc resistance from E16 (+5-Vdc terminal) to E15 (ground) on dc-to-dc converter A3, with positive lead of multimeter on E16.	NLT 100 ohms.	Refer to table 4, step 3.
4	Ensure that all switches on the power sources are in the OFF position. Set the test fixture PWR switch to OFF; the VOX and KEY switches to OFF; and the FAULT switches to GOOD.		
5	Check the type of panel lights in the 514A-3/4/5 under test. If the panel lights are the 5-volt type, set the test fixture PANEL LIGHTS switch to the 28 V position. If the lights are the 28-volt type, set the test fixture switch to the 5 V position. Connect the 514A-3/4/5 to the test fixture as shown in figure 4.		
	Note		
	Unless otherwise noted, references to switches, test points, and indicators are items located on the 514A-3/4/5 test fixture.		
6	Turn on the +28-Vdc power supply. Turn on the +5-Vdc power supply and adjust the output to +5 Vdc. Turn on the +15-Vdc power supply and adjust the output to +15 Vdc.	RF TEST indicator on the 514A-3/4/5 should be off.	Refer to table 4, step 40.
7	Set the PWR switch on the test fixture to ON.		

Table 3. Performance Test Procedures (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
8	Use the digital voltmeter (dvm) to measure the voltage between terminal E16 (positive) and E15 (ground) on the dc-to-dc converter (A1) in the 514A-3/4/5.	From +1.2 to +1.8 Vdc.	Refer to table 4, step 4.
	INITIAL CONTROL SETTINGS		
9	Set the 514A-3/4/5 FREQUENCY selectors to 2.0000 MHz, and set the mode and squelch switches to the ccw stop position.		
	DC-TO-DC CONVERTER OUTPUT TEST		
10	Increase the output level of the +15-Vdc power supply to +15 Vdc.		
11	With dvm, measure the dc voltage between E16 (positive) and E15 (ground) on dc-to-dc converter A3.	From +5.1 to +5.4 Vdc.	Refer to table 4, step 5.
	CLOCK FREQUENCY TEST		
12	Set oscilloscope controls as follows: SYNC - EXT TIME-DELAY - 100 μs/cm sweep VOLTS/DIV - 2 volts per cm		
13	With ac probe connected to TP4 on the 514A-3/4/5, adjust LEVEL control to sync the signal on the scope.		
14	With oscilloscope, measure the period of the square wave at TP4 on the 514A-3/4/5.	400 to 435 μs.	Refer to table 4, step 7.
	WT64 SIGNAL TEST		
15	Set oscilloscope TIME-DELAY control to 10 ms/cm sweep and measure the period of the square wave at TP1 on the 514A-3/4/5.	50 to 57 ms.	Refer to table 4, step 8.
	DATA OUTPUT LEVEL TEST		
16	Set oscilloscope TIME-DELAY control to 100 μs/cm sweep and observe the waveform at the DATA test point, TP6. Measure the amplitude of the 1 logic level and the 0 logic level signals with respect to ground (from DATA test point to GND test point on the test fixture).	1 logic level, +2 to +4 Vdc. 0 logic level, 0 to +0.5 Vdc.	Refer to table 4, step 11.
17	Repeat step 16 at the DATA RTN test point TP7; note that the waveform is inverted with respect to step 16.	1 logic level, +2 to +4 Vdc. 0 logic level, 0 to +0.5 Vdc.	Refer to table 4, step 12.

Table 3. Performance Test Procedures (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
	DATA OUTPUT TESTS		
	Note		
	Unless otherwise noted, the 514A-3/4/5 controls shall be set the same as step 9.		
18	Key (push-to-talk) check		
	Note		
	This test applicable only to 514A-4.		
	a. Set the KEY switch on the test fixture to ON.	KEY indicator on test fixture lights.	Refer to table 4, step 23.
	b. Return the KEY switch to OFF.	KEY indicator turns off.	Same as above.
19	VOX enable check		
	Note		
	This test applicable only to 514A-4.		
	a. Set the VOX switch on the test fixture to ON.	VOX indicator on test fixture lights.	Refer to table 4, step 24.
	b. Return the VOX switch to OFF.	VOX indicator turns off.	Same as above.
20	Squelch (SQL) check		
	a. Connect the digital voltmeter to the ANALOG SQL test point on the test fixture. Set the SQL control on the 514A-3/4/5 to the extreme ccw position (position 1).		
	b. Measure the voltage at each SQL control position.		
	SQL CONTROL POSITION		
	1 (ccw stop)	From +2.52 to +2.67 Vdc.	Refer to table 4, step 25.
	2	From +2.28 to +2.44 Vdc.	
	3	From +2.03 to +2.18 Vdc.	
	4	From +1.72 to +1.89 Vdc.	
	5	From +1.32 to +1.5 Vdc.	
	6	From +0.82 to +1.0 Vdc.	
	7	From +0.16 to +0.36 Vdc.	
	8	SQL ENBL indicator on test fixture lights.	
	c. Set the SQL control to position 7.	SQL ENBL indicator turns off.	

Table 3. Performance Test Procedures (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
21	Mode check		
	a. Set the mode selector control on the 514A-3/4/5 to the OFF position.	None of the MODE indicators on the test fixture should light. The PWR ENBL indicator on the test fixture should be off.	
	b. Rotate the mode selector control through the USB, LSB, AM, CW, SVU, and SVL positions and check that the corresponding test fixture MODE indicators light.	MODE indicators (USB, LSB, AM, CW, SVU, and SVL) on the test fixture light when the mode selector control is in the corresponding position and turn off when the control is changed. The PWR ENBL indicator lights for all positions of the control except OFF.	Refer to table 4, step 39.
	c. Set the mode selector control on the 514A-3/4/5 to the RF TEST position.	RF TEST indicator on the 514A-3/4/5 is off. AM and RF TEST indicators on the test fixture should light.	Refer to table 4, step 33.
	d. Return the mode selector control to the AM position.	AM indicator on the test fixture remains lit, while the RF TEST indicator on the test fixture turns off.	Refer to table 4, step 29.
22	Frequency check		
	a. Rotate in turn, through all positions, the 100-Hz, 1-kHz, 10-kHz, and 100-kHz FREQUENCY selector controls. Determine that the corresponding test fixture indicators light in accordance with the following table:		

FREQUENCY SELECTOR CONTROL POSITION	100-Hz, 1-kHz, 10-kHz, 100-kHz INDICATORS			
	(8)	(4)	(2)	(1)
1	0	0	0	●
2	0	0	●	0
3	0	0	●	●
4	0	●	0	0
5	0	●	0	●
6	0	●	●	0
7	0	●	●	●
8	●	0	0	0
9	●	0	0	●
0	0	0	0	0

(Cont) Note: ● -- indicator on; 0 -- indicator off.

Table 3. Performance Test Procedures (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
22 (Cont)	b. Rotate the MHz frequency controls on the 514A-3/4/5 through all positions from 2 to 29 MHz. Determine that the corresponding test fixture indicators light in accordance with the following table.		Refer to table 4, step 34.

1-MHZ CONTROL SETTING	1-MHz INDICATORS (8)	(4)	(2)	(1)
1	0	0	0	●
2	0	0	●	0
3	0	0	●	●
4	0	●	0	0
5	0	●	0	●
6	0	●	●	0
7	0	●	●	●
8	●	0	0	0
9	●	0	0	●
0	0	0	0	0

10-MHZ CONTROL SETTING	10-MHz INDICATORS (2)	(1)
0	0	0
1	0	●
2	●	0

Note: ● -- indicator on; 0 -- indicator off.

23	Rotate all the frequency selector controls on the 514A-3/4/5 through all positions and observe the PA TUNE START indicator on the test fixture at each control position.	PA TUNE START and CPLR TUNE START indicators on the test fixture turn on momentarily at each control position.	For consistent failure, refer to table 4, step 37. For intermittent failure, examine the top brush contact (spring loaded) with the indicated frequency counter wheel. If necessary, remove the contact brush assembly and carefully bend the spring contact to increase the pressure. Replace the brush assembly and repeat step 23.

Table 3. Performance Test Procedures (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
24	RF TEST check		
	a. Set the mode selector control on the 514A-3/4/5 to the RF TEST position.	RF TEST and AM indicators on the test fixture turn on.	Refer to table 4, step 20.
	b. Set the SMO FAULT switch on the test fixture to the FAULT position.	RF TEST indicator on the 514A-3/4/5 lights steadily.	
	c. Return the SMO FAULT switch to the GOOD position.	RF TEST indicator on the 514A-3/4/5 turns off.	
	d. Set the PA FAULT switch on the test fixture to the FAULT position.	RF TEST indicator on the 514A-3/4/5 blinks.	
	e. Return the PA FAULT switch to the GOOD position.	RF TEST indicator on the 514A-3/4/5 turns off.	
25	Panel light test		
	a. Determine whether the 514A-3/4/5 unit under test has 5-volt or 28-volt lighting.		
	b. For units with 5-volt lighting, place the PANEL LIGHTS switch on the test fixture in the 5-volt position.	514A-3/4/5 panel lights turn on; all edge lit markings are illuminated.	Refer to table 4, step 21.
	c. Return the PANEL LIGHTS switch to the 28 V position.	Panel lights turn off.	
	d. For units with 28-volt lighting, place the PANEL LIGHTS switch on the test fixture to the 28 V position.	Same as step b above.	
	e. Return the PANEL LIGHTS switch to the 5 V position.	Panel lights turn off.	
26	Shutdown		
	Turn off the PWR switch on the test fixture. Turn off all power supplies and disconnect the test equipment. Replace the cover on the 514A-3/4/5.		

Table 4. Troubleshooting Procedure.

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
1	Perform step 1 of table 3.		
2	Measure the dc resistance between the +15-Vdc line and the 15-Vdc common line on the 514A-3/4/5 rear connector. Place the multimeter lead that has positive voltage on the connector pin that has positive voltage. **Note** The common lead is positive on some multimeters.	NLT 400 ohms. Proceed to step 3.	Proceed to step 6.
3	Measure the dc resistance between E16 and (+5-Vdc) and E15 (common) on dc-to-dc converter A1 with the positive meter lead on E16.	NLT 100 ohms. Proceed to step 4.	Remove circuit card A2. Recheck dc resistance. If still bad, replace faulty dc-to-dc converter A1.
4	Perform steps 4, 5, 6, 7, and 8 of table 3.	From +1.2 to +1.8 Vdc. Proceed to step 5.	Replace faulty dc-to-dc converter A1.
5	Perform steps 9, 10, and 11 of table 3.	From +5.1 to +5.4 Vdc. Proceed to step 7.	Replace faulty dc-to-dc converter A1.
6	Unsolder leads from E14 and E13 on dc-to-dc converter A1. Measure dc resistance between E14 and E13.	NLT 400 ohms. Repair faulty wiring between the 514A-3/4/5 rear connector and E14 and E13 on dc-to-dc converter A1.	Replace faulty dc-to-dc converter A1.
7	Perform steps 12, 13, and 14 of table 3.	400 to 435 μs. Proceed to step 8.	Replace faulty circuit card A2.
8	Perform step 15 of table 3.	50 to 57 ms. Proceed to step 9.	Same as step 7.
9	Perform step 16 of table 3.	Logic 1 (+2 to +4 Vdc). Logic 0 (0 to +0.5 Vdc). Proceed to step 10.	Proceed to step 11.
10	Perform step 17 of table 3.	Logic 1 (+2 to +4 Vdc). Logic 0 (0 to +0.5 Vdc). Proceed to step 13.	Proceed to step 12.
11	Check continuity between DATA test point on test fixture and J2-38 in the 514A-3/4/5.	Replace faulty circuit card A2.	Repair faulty wiring between TP6 and J2-38.
12	Check continuity between DATA RTN test point on test fixture and J2-40 in the 514A-3/4/5.	Replace faulty circuit card A2.	Repair faulty wiring between TP7 and J2-40.
13	Perform step 18 of table 3.	KEY switch on test fixture ON. KEY indicator on test fixture lights. KEY switch OFF. KEY indicator turns off. Proceed to step 14.	Proceed to step 23.

Table 4. Troubleshooting Procedure (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
14	Perform step 19 of table 3.	VOX switch on test fixture ON. VOX indicator on test fixture lights. VOX switch OFF. VOX indicator turns off. Proceed to step 15.	Proceed to step 24.
15	Perform step 20 of table 3.	Same as step 20 of table 3. Proceed to step 16.	Proceed to step 25.
16	Perform step 21 of table 3.	Same as step 21 of table 3. Proceed to step 17.	Proceed to step 29 or step 33.
17	Perform step 22a of table 3.	Same as step 22a of table 3. Proceed to step 18.	Proceed to step 34.
18	Perform step 22b of table 3.	Same as step 22c of table 3. Proceed to step 19.	Proceed to step 34.
19	Perform step 23 of table 3.	Same as step 23 of table 3. Proceed to step 20.	Proceed to step 37.
20	Perform step 24 of table 3.	Same as step 24 of table 3. Proceed to step 21.	Proceed to step 41.
21	Perform step 25 of table 3.	Same as step 25 of table 3. Perform the performance test procedures of table 3. ***Note*** Indications in this column are normal for the corresponding procedural step, even though the equipment is faulty.	Proceed to step 43.
22	Proceed to step 23.		
23	Check continuity between the key line on the 514A-4 rear connector and J2-1.	Replace faulty circuit card A2.	Repair faulty wiring between rear connector and J2-1.
24	Check continuity between the VOX enable line on the 514A-4 rear connector and J2-2.	Replace faulty circuit card A2.	Repair faulty wiring between rear connector and J2-2.
25 (Cont)	Turn off all power to the test fixture. Disconnect the 514A-3/4/5 from the test cable. Remove circuit card A2 from the 514A-3/4/5. Measure dc resistance to ground from J2-3, 4, and 10 for each position of the SQL control on the 514A-3/4/5. Compare results with the table below.	Proceed to step 26.	Proceed to step 27.

Table 4. Troubleshooting Procedure (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
25 (Cont)	SQL CONT POSITION / J2-3 / J2-10 / J2-4 1 H H H 2 L H H 3 H L H 4 L L H 5 H H L 6 L H L 7 H L L 8 L L L H = More than 100,000 ohms to ground. L = Less than 10 ohms to ground.		
26	Install new circuit card A2 in the 514A-3/4/5 and repeat step 20 of table 3.	Fault exists in original circuit card A2.	Check test fixture. Proceed to step 27.
27	Check wiring from J2-3, 4, and 10 to SQL control on the 514A-3/4/5 for continuity or shorts to ground.	Proceed to step 28.	Replace faulty wiring.
28	Check SQL switch on the 514A-3/4/5 for proper operation.	Return to step 16. Continue from that point.	Replace faulty SQL switch.
29	Turn off all power to the test fixture. Disconnect the 514A-3/4/5 from the test cable. Remove circuit card A2 from the 514A-3/4/5. Measure dc resistance to ground from J2-5, 7, and 8 for each position of the mode control on the 514A-3/4/5. Compare results with the table below. MODE CONT POSITION / J2-5 / J2-7 / J2-8 OFF H H H USB L H H LSB H L H AM L L H *CW H H L *SVU L H L *SVL H L L RF TEST L L L *514A-4, Collins part number 792-6122-003, does not contain CW, SVU, and SVL functions. H = More than 100,000 ohms to ground. L = Less than 10 ohms to ground.	Proceed to step 30.	Proceed to step 31.
30	Install new circuit card A2 in the 514A-3/4/5 and repeat step 21 of table 3.	Fault exists in original circuit card A2.	Check test fixture. Proceed to step 31.

Table 4. Troubleshooting Procedure (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
14	Perform step 19 of table 3.	VOX switch on test fixture ON. VOX indicator on test fixture lights. VOX switch OFF. VOX indicator turns off. Proceed to step 15.	Proceed to step 24.
15	Perform step 20 of table 3.	Same as step 20 of table 3. Proceed to step 16.	Proceed to step 25.
16	Perform step 21 of table 3.	Same as step 21 of table 3. Proceed to step 17.	Proceed to step 29 or step 33.
17	Perform step 22a of table 3.	Same as step 22a of table 3. Proceed to step 18.	Proceed to step 34.
18	Perform step 22b of table 3.	Same as step 22c of table 3. Proceed to step 19.	Proceed to step 34.
19	Perform step 23 of table 3.	Same as step 23 of table 3. Proceed to step 20.	Proceed to step 37.
20	Perform step 24 of table 3.	Same as step 24 of table 3. Proceed to step 21.	Proceed to step 41.
21	Perform step 25 of table 3.	Same as step 25 of table 3. Perform the performance test procedures of table 3. ***Note*** Indications in this column are normal for the corresponding procedural step, even though the equipment is faulty.	Proceed to step 43.
22	Proceed to step 23.		
23	Check continuity between the key line on the 514A-4 rear connector and J2-1.	Replace faulty circuit card A2.	Repair faulty wiring between rear connector and J2-1.
24	Check continuity between the VOX enable line on the 514A-4 rear connector and J2-2.	Replace faulty circuit card A2.	Repair faulty wiring between rear connector and J2-2.
25 (Cont)	Turn off all power to the test fixture. Disconnect the 514A-3/4/5 from the test cable. Remove circuit card A2 from the 514A-3/4/5. Measure dc resistance to ground from J2-3, 4, and 10 for each position of the SQL control on the 514A-3/4/5. Compare results with the table below.	Proceed to step 26.	Proceed to step 27.

Table 4. Troubleshooting Procedure (Cont).

<table>
<tr><th>STEP</th><th>PROCEDURE</th><th>NORMAL INDICATION</th><th>ABNORMAL INDICATION</th></tr>
<tr><td>25 (Cont)</td><td>
<table>
<tr><th>SQL CONT POSITION</th><th>J2-3</th><th>J2-10</th><th>J2-4</th></tr>
<tr><td>1</td><td>H</td><td>H</td><td>H</td></tr>
<tr><td>2</td><td>L</td><td>H</td><td>H</td></tr>
<tr><td>3</td><td>H</td><td>L</td><td>H</td></tr>
<tr><td>4</td><td>L</td><td>L</td><td>H</td></tr>
<tr><td>5</td><td>H</td><td>H</td><td>L</td></tr>
<tr><td>6</td><td>L</td><td>H</td><td>L</td></tr>
<tr><td>7</td><td>H</td><td>L</td><td>L</td></tr>
<tr><td>8</td><td>L</td><td>L</td><td>L</td></tr>
</table>
H = More than 100,000 ohms to ground.
L = Less than 10 ohms to ground.</td><td></td><td></td></tr>
<tr><td>26</td><td>Install new circuit card A2 in the 514A-3/4/5 and repeat step 20 of table 3.</td><td>Fault exists in original circuit card A2.</td><td>Check test fixture. Proceed to step 27.</td></tr>
<tr><td>27</td><td>Check wiring from J2-3, 4, and 10 to SQL control on the 514A-3/4/5 for continuity or shorts to ground.</td><td>Proceed to step 28.</td><td>Replace faulty wiring.</td></tr>
<tr><td>28</td><td>Check SQL switch on the 514A-3/4/5 for proper operation.</td><td>Return to step 16. Continue from that point.</td><td>Replace faulty SQL switch.</td></tr>
<tr><td>29</td><td>Turn off all power to the test fixture. Disconnect the 514A-3/4/5 from the test cable. Remove circuit card A2 from the 514A-3/4/5. Measure dc resistance to ground from J2-5, 7, and 8 for each position of the mode control on the 514A-3/4/5. Compare results with the table below.
<table>
<tr><th>MODE CONT POSITION</th><th>J2-5</th><th>J2-7</th><th>J2-8</th></tr>
<tr><td>OFF</td><td>H</td><td>H</td><td>H</td></tr>
<tr><td>USB</td><td>L</td><td>H</td><td>H</td></tr>
<tr><td>LSB</td><td>H</td><td>L</td><td>H</td></tr>
<tr><td>AM</td><td>L</td><td>L</td><td>H</td></tr>
<tr><td>*CW</td><td>H</td><td>H</td><td>L</td></tr>
<tr><td>*SVU</td><td>L</td><td>H</td><td>L</td></tr>
<tr><td>*SVL</td><td>H</td><td>L</td><td>L</td></tr>
<tr><td>RF TEST</td><td>L</td><td>L</td><td>L</td></tr>
</table>
*514A-4, Collins part number 792-6122-003, does not contain CW, SVU, and SVL functions.

H = More than 100,000 ohms to ground.
L = Less than 10 ohms to ground.</td><td>Proceed to step 30.</td><td>Proceed to step 31.</td></tr>
<tr><td>30</td><td>Install new circuit card A2 in the 514A-3/4/5 and repeat step 21 of table 3.</td><td>Fault exists in original circuit card A2.</td><td>Check test fixture. Proceed to step 31.</td></tr>
</table>

Table 4. Troubleshooting Procedure (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
31	Check wiring from J2-5, 7, and 8 to mode control on the 514A-3/4/5 for continuity and shorts to ground.	Proceed to step 32.	Repair faulty wiring.
32	Check mode control on the 514A-3/4/5 for proper operation.	Return to step 17. Continue from that point.	Replace faulty mode control.
33	Set FAULT switches on the test fixture to the GOOD position.	Proceed to step 40.	With the FAULT switches in the GOOD position, repeat step 21c of table 3.
34	Turn off all power to the test fixture. Disconnect the 514A-3/4/5 from the test cable. Remove circuit card A2 from the 514A-3/4/5. Measure dc resistance to ground from J2 pins, as indicated in table 5, for each position of the appropriate frequency control on the 514A-3/4/5.	Proceed to step 35.	Proceed to step 36.
35	Install a new circuit card A2 in the 514A-3/4/5. Repeat step 22 of table 3.	Fault exists in original circuit card A2.	Check test fixture.
36	Check continuity between J2 and the appropriate frequency control switch.	Replace faulty frequency control switch.	Repair faulty wiring between J2 and the appropriate frequency control switch.
37	Turn off all power to the test fixture. Disconnect the 514A-3/4/5 from the test cable. Remove circuit card A2 from the 514A-3/4/5. Rotate each frequency control switch through all positions and check for a momentary ground (dc) on J2-6 for each frequency step.	Proceed to step 38.	Proceed to step 39.
38	Install new circuit card A2 in the 514A-3/4/5. Repeat step 23 of table 3.	Fault exists in original circuit card A2.	Check test fixture.
39	Check the wiring between J2-6 and the appropriate frequency control for continuity or shorts to ground.	Check brush spring contacts and printed circuits on the side of the faulty frequency control wheel (switch assembly).	Repair faulty wiring between J2-6 and appropriate frequency control.
40	Check for a short (ground) on the wire between RF TEST indicator on the 514A-3/4/5 and the rf test return pin on J1, also on the 514A-3/4/5.	a. Replace or repair faulty lamp socket. b. Check the test fixture RF TEST return line for short to ground.	Repair faulty wiring between the RF TEST indicator and J1.
41	Check for faulty RF TEST lamp (DS1).	Proceed to step 42.	Replace faulty lamp.
42	Check continuity between the RF TEST and RF TEST return lines on J1 and the socket of the RF TEST indicator on the 514A-3/4/5.	a. Check test fixture to determine that +28 Vdc is applied across RF TEST and RF TEST return line. b. Replace faulty RF TEST indicator socket (DS1).	Repair faulty wiring between DS1 (socket) and J1 on the 514A-3/4/5.

Table 4. Troubleshooting Procedure (Cont).

STEP	PROCEDURE	NORMAL INDICATION	ABNORMAL INDICATION
43	Check continuity between the 28 V and PANEL LIGHT COMMON; or 5 V and PANEL LIGHT COMMON, and panel lights.	Replace or repair panel lights.	Repair faulty wiring between panel lights and J1.

Table 5. Frequency Control Switches, Truth Table.

DIGIT READING	514A-3/4/5 CONNECTOR J1 PIN NUMBERS																					
	100 Hz				1 kHz				10 kHz				100 kHz				1 MHz				10 MHz	
	9	11	12	13	15	14	16	17	18	20	19	24	23	25	26	28	34	35	37	30	39	33
0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
1	X	O	O	O	X	O	O	O	X	O	O	O	X	O	O	O	X	O	O	O	X	O
2	O	X	O	O	O	X	O	O	O	X	O	O	O	X	O	O	O	X	O	O	O	X
3	X	X	O	O	X	X	O	O	X	X	O	O	X	X	O	O	X	X	O	O		
4	O	O	X	O	O	O	X	O	O	O	X	O	O	O	X	O	O	O	X	O		
5	X	O	X	O	X	O	X	O	X	O	X	O	X	O	X	O	X	O	X	O		
6	O	X	X	O	O	X	X	O	O	X	X	O	O	X	X	O	O	X	X	O		
7	X	X	X	O	X	X	X	O	X	X	X	O	X	X	X	O	X	X	X	O		
8	O	O	O	X	O	O	O	X	O	O	O	X	O	O	O	X	O	O	O	X		
9	X	O	O	X	X	O	O	X	X	O	O	X	X	O	O	X	X	O	O	X		

X = Grounded
O = Open

6. REPAIR

6.1 Replacement of Faulty Contact Brush Assembly

Refer to figure 2 in the parts list section of this instruction book. Remove the dust cover from the 514A-3/4/5 (paragraph 5.1, this section). Remove screw (2) from the faulty contact brush assembly. Note where the wires from the contact brush assembly are connected. Unsolder the wires and remove them from the cable. Install the new contact brush assembly on the counter casting and secure it with screw (2). Use care to align the tabs on the bottom of the contact brush assembly with the holes in the counter casting. Route the wires from the contact brush assembly through the cable and solder them to the proper termination points. Check the alignment of the spring arms on the contact brush assembly with the printed circuits on the side of the counter wheel. The outer spring arm should be approximately centered on the insulated segment of the associated counter wheel printed circuit. If necessary, realign the counter wheel as described in paragraph 7 (adjustments) of this section. Reassemble the unit.

6.2 Repair or Replacement of Faulty Frequency Switch Detent

Refer to figure 2 in the parts list section of this instruction book. Detent action is provided by a spring-loaded ball bearing (28, 29) riding on a detent wheel. Faulty detent action may be corrected by removing the dust cover (paragraph 5.1 of this section), the associated spring plate (24 or 25), and spring. Remove the bearing from the socket in the counter casting. Clean the bearing, socket, and detent wheel. Examine the bearing for a rough or scratched surface. If damaged, replace it. Lubricate the bearing, socket, and the detent wheel with a light coat of Beacon 325 aircraft instrument grease (Collins part number 005-0423-000). Replace the bearing, spring, and plate. Check the switch for proper detent action. Reassemble the unit.

Repair and replacement of other components within the 514A-3/4/5 should be performed by using standard shop practices and maintenance procedures.

7. ADJUSTMENTS

7.1 Counter Wheel Alignment

Refer to figure 2 in the parts list section of this instruction book. The frequency counter wheels (13, 23) provide both electrical switching and frequency readout information. The counter wheels can be realigned by removing the dust cover (paragraph 5.1 of this section), and locating the counter wheel that is to be adjusted. Then, loosen the setscrews that secure the idler spur gear (75, 55, 65, 39, 47, 31) to the shaft that drives the counter wheel. Rotate the counter wheel to approximately center the outside spring arm of the associated contact brush assembly on an insulated segment of the printed circuit on the side of the counter wheel. Tighten the idler spur gear setscrews. The idler spur gear should be fully meshed with the counter wheel teeth, but should not bind against the counter wheel.

The 10-MHz counter wheel is driven through a transfer gear (71, 74), which steps one position for each complete revolution of the 1-MHz counter wheel. To adjust the 10-MHz or 1-MHz counter wheels, the correct synchronization must be maintained. Set the 10-MHz counter wheel on 0 and the 1-MHz counter wheel on 3, as viewed from the front of the 514A-3/4/5. Transfer gear (71, 74) should now be positioned with securing setscrew (72) toward the bottom of the unit chassis and pin (73) toward the front side of the chassis. Loosen the setscrews in the 10-MHz or 1-MHz idler spur gear (75 or 55). Rotate the counter wheel to approximately center the outside spring arm of the associated contact brush assembly on an insulated segment of the printed circuit on the side of the counter wheel. Tighten the idler spur gear setscrews. Check the MHz stop mechanism by turning the 1-MHz switch to the 2-MHz stop, and then clockwise to the 29-MHz stop. The overtravel should be nearly equal at both ends. If not, set the MHz controls to the 02 positions and loosen transfer gear setscrew (72). Rotate transfer gear (71, 74) slightly. Tighten setscrew (72) and recheck the overtravel at both end stops. Repeat this procedure until the overtravel at each stop position is equal. Reassemble the unit.

7.2 Mode Switch Alignment

Refer to figure 1 in the parts list section of this instruction book. To adjust the mechanical stops on the mode switch, remove the mode control knob, and loosen the setscrews on the adapter fitted on the front end of the mode switch shaft (16, 17). Rotate the mode switch shaft so that the position markers (two red dots) on the rear of the switch are in alignment. Rotate the adapter counterclockwise until the tang (key) is within 0.003 to 0.015 inch of the stop and tighten the setscrews. Rotate the mode switch clockwise through all positions and check for 0.003- to 0.015-inch clearance between the tang and stop. Readjust the adapter on the shaft if necessary. Repeat this procedure until the switch functions within the required tolerances.

After a period of use, the red position markers may be worn off so that the mode switch alignment will have to be performed differently.

The mode switch is a 12-position switch (physically) with stops at the 1 and 8 positions. Table 6 shows the required sequence of functions as the switch is rotated clockwise from position 1 through position 8, and the erroneous sequence if the switch rotation is continued (clockwise)

past the stop through position 12. When the markers are not visible and the switch has been turned past position 8, perform steps 21a, b, and c of the performance test procedures, table 3, if the unit is functioning normally in all other respects; or perform step 29 of the troubleshooting procedures, table 4, if the unit is not functioning properly. When the OFF position (position 1) has been determined (as opposed to positions 9 or 11), mark the switch with paint dots so that future alignment, if necessary, will be simpler. Then, proceed with the alignment as specified in this paragraph.

Table 6. Mode Switch Outputs for All 12 Positions.

MODE SWITCH POSITION	MODE SWITCH FUNCTION	
1	OFF	Required sequence
2	USB	
3	LSB	
4	AM	
5	CW	
6	SVU	
7	SVL	
8	RF TEST	
9	OFF	Error sequence
10	USB	
11	OFF	
12	USB	

514A-3/4/5 Radio Set Control

COLLINS

parts list

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list of illustrations

Figure	*Page*
1 514A-3/4/5 Radio Set Control	5
2 Counter Assembly	11
3 Transmitter Board Control	15
4 Circuit Card Assembly	18
5 Converter, 15 VDC to 5 VDC	19

NOTICE: This section replaces first edition dated 15 May 1970.

List of Effective Pages

*The asterisk indicates pages changed, added, or deleted by the current change.

Page No	Issue
*Tab Divider	1 Dec 71
*Title	1 Dec 71
*A	1 Dec 71
*Rec of Rev	1 Dec 71
*1 thru 5	1 Dec 71
6 Blank	15 May 70
*7 thru 11	1 Dec 71
12 Blank	15 May 70
*13 thru 22	1 Dec 71
*23 Added	1 Dec 71
*24 Blank Added	1 Dec 71

Record of Revisions

RETAIN THIS RECORD IN THE FRONT OF MANUAL.
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL, AND ENTER DATE INSERTED AND INITIALS.

ASSIGNED TO (JOB TITLE)	LOCATION

REV. NO.	REVISION DATE	INSERTION DATE	BY	REV. NO.	REVISION DATE	INSERTION DATE	BY
1st Ed	15 May 70						
2nd Ed	1 Dec 71						

1. INTRODUCTION

1.1 General

The purpose of this parts list is for identification, requisition, and issuance of parts.

1.2 Group Assembly Parts List

FIG - ITEM Column -- Digits preceding the dash refer to the figure number. Digits following the dash are the item numbers assigned in sequence to correspond with the item numbers on the illustration.

PART NO Column -- Listed are MIL standard, vendor, or Collins Radio Company part numbers. Collins part numbering system consists of 10 digits as follows: a 3-digit family number, a 4-digit serial number, and a 3-digit dash number.

INDENT Column -- Items are coded 1, 2, 3, etc, to indicate the relationship to the next higher assembly.

DESCRIPTION Column -- The noun name, modifier, required descriptive information, federal manufacturer code for each vendor part number, reference designation for each electrical item, attaching part (AP), and reference to other figures and effectivities are listed.

Attaching parts are identified by (AP) following the part or parts they attach.

Effectivities are identified by MCN (manufacture control number) 101 and up or CI (configuration identifier) 5-digit number recorded on each chassis and/or replaceable assembly.

USABLE ON CODE Column -- Part variations within the groups of equipment are indicated by a letter symbol (A, B, C, etc). The absence of the symbol indicates parts apply to all models.

UNITS PER ASSY Column -- Quantities specified are per item number. The letters AR denote the selection of parts as required. The letters REF refer to an assembly completely assembled on a preceding figure and illustration.

1.3 Numerical Index

PART NUMBER Column -- Part numbers are in alphanumeric sequence.

FIG - ITEM Column -- Digits preceding the dash refer to the figure number. Digits following the dash are the item numbers.

TTL REQ Column -- Listed is the total quantity of parts or assemblies for the equipment.

1.4 Reference Designation Index

REFERENCE DESIGNATION Column -- Reference designations are listed in alphanumeric sequence.

FIG - ITEM Column -- Digits preceding the dash refer to the figure number. Digits following the dash are the item numbers.

PART NUMBER Column -- Part numbers listed in this column have been assigned reference designation symbols.

1.5 Manufacturer's Code, Name, and Address

CODE	MANUFACTURER'S NAME AND ADDRESS
03038	Long-Lok Corp. 4101 Redwood Ave. Los Angeles, CA 90066
05411	Du Page Mfg. Co. 2250 Curtiss Ave. Downers Grove, IL 60515
07263	Fairchild Semiconductor A Div. of Fairchild Camera and Instrument Corp. 464 Ellis St. Mountain View, CA 94040
07388	Torotel, Inc. 13402 S. 71 Hwy. Grandview, MO 64030
07688	Joint Electron Device Engineering Council Washington, DC 20000
08817	Epec Industries, Inc. New Bedford Industrial Park New Bedford, MA 02745
09922	Burndy Corp. Richards Ave. Norwalk, CT 06852
12615	U. S. Terminals, Inc. 7504 Camargo Rd. Cincinnati, OH 45243
12639	Northfield Precision Instrument Corp. 4400 Austin Blvd. Island Park, NY 11558
13499	Collins Radio Co. 5225 C. Ave. NE Cedar Rapids, IA 52406
17537	Los Angeles Miniature Products, Inc. 17000 S. Western Gardena, CA 90247
18324	Signetics Corp. 811 E. Argues Ave. Sunnyvale, CA 94086
27014	National Semi-Conductor Corp. 2950 San Ysidro Way Santa Clara, CA 95051
27545	Hartford-Universal Co. 1022 Elm St. Rocky Hill, CT 06067
43710	Ney, J. M. Co., The Drawer 900 Hartford, CT 06101
49956	Raytheon Co. 141 Spring St. Lexington, MA 02173
56289	Sprague Electric Co. North Adams, MA 01247
70318	Allmetal Screw Products Co., Inc. 821 Stewart Ave. Garden City, NY 11530
70417	Chrysler Corp. Amplex Div. 6501 Harper Ave. Detroit, MI 48211
71279	Cambridge Thermionic Corp. 445 Concord Ave. Cambridge, MA 02138
71785	Cinch Mfg. Co. Div. of TRW, Inc. 1501 Morse Ave. Elk Grove Village, IL 60007
72794	Dzus Fastener Co., Inc. 425 Union Blvd. West Islip, NY 11795
72962	Elastic Stop Nut Div. of Amerace Esna Corp. 2330 Vauxhall Rd. Union, NJ 07083

CODE	MANUFACTURER'S NAME AND ADDRESS
72982	Erie Technological Products, Inc. 644 W. 12th St. Erie, PA 16512
75618	Lion Fastener Co., Inc. N. Main Honeoye Falls, NY 14472
77147	Patton-MacGuyer Co. Div. of Avid Corp. 17 Virginia Ave. Providence, RI 02905
77250	Pheoll Mfg. Co. Div. of Allied Products Corp. 5700 W. Roosevelt Rd. Chicago, IL 60650
77820	Bendix Corp., The Electrical Components Div. Sherman Ave. Sidney, NY 13838
79136	Waldes Kohinoor, Inc. 47-16 Austel Place Long Island City, NY 11101
79807	Wrought Washer Mfg. Co. 2100 S. Bay St. Milwaukee, WI 53207
79963	Zierick Mfg. Co. Radio Circle Mt. Kisco, NY 10549
81349	Military Specifications
81350	Joint Army-Navy Specifications
91663	Armel Electronics, Inc. 1601 75th St. North Bergen, NJ 07047
93332	Sylvania Electric Products, Inc. Semiconductor Products Div. 100 Sylvan Rd. Woburn, MA 01801
94222	Southco, Inc. Lester, PA 19113
96906	Military Standards

1.6 Usage Code

The following codes have been assigned in this manual:

USAGE CODE	UNIT PART NUMBER	FIGURE
A	792-6121-001	1
B	792-6122-001	1
C	792-6123-001	1
D	792-6122-002	1

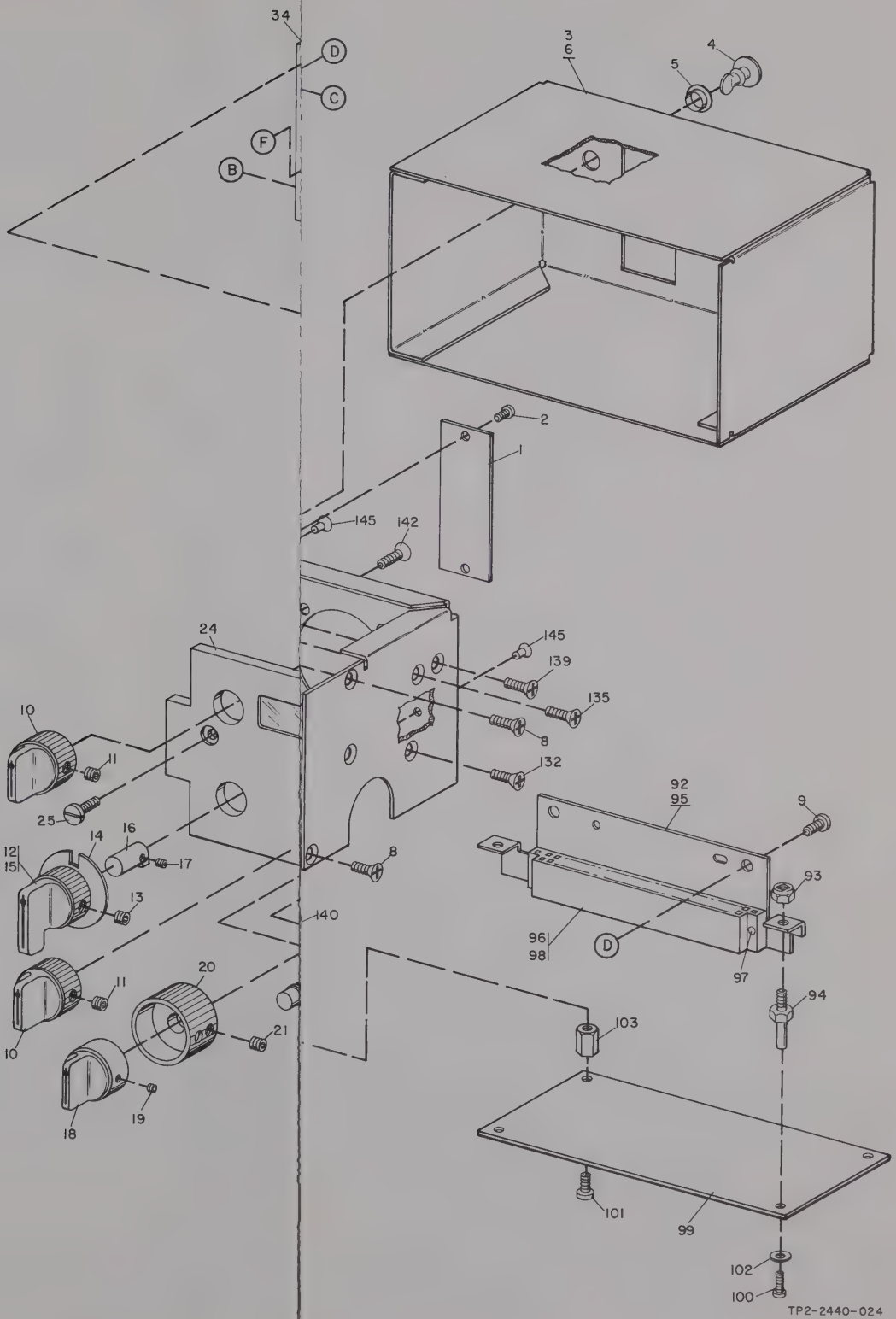
1.7 Reference Designation Prefixes

PREFIX	UNIT PART NUMBER	FIGURE
A1	790-2505-001	1-104
A1	609-0681-001	1-104
A1	609-0681-001	5
A1A1	797-3523-001	4
A2	793-9264-001	3

1.8 Configuration Identifier

The following configuration identifiers have been assigned in this manual:

CI	UNIT PART NUMBER	FIGURE
71355	792-6121-001	1
71483	792-6122-001	1
71453	792-6123-001	1
71516	792-6122-002	1
70393	793-9264-001	3
70426	797-3523-001	4
71326	609-0681-001	5



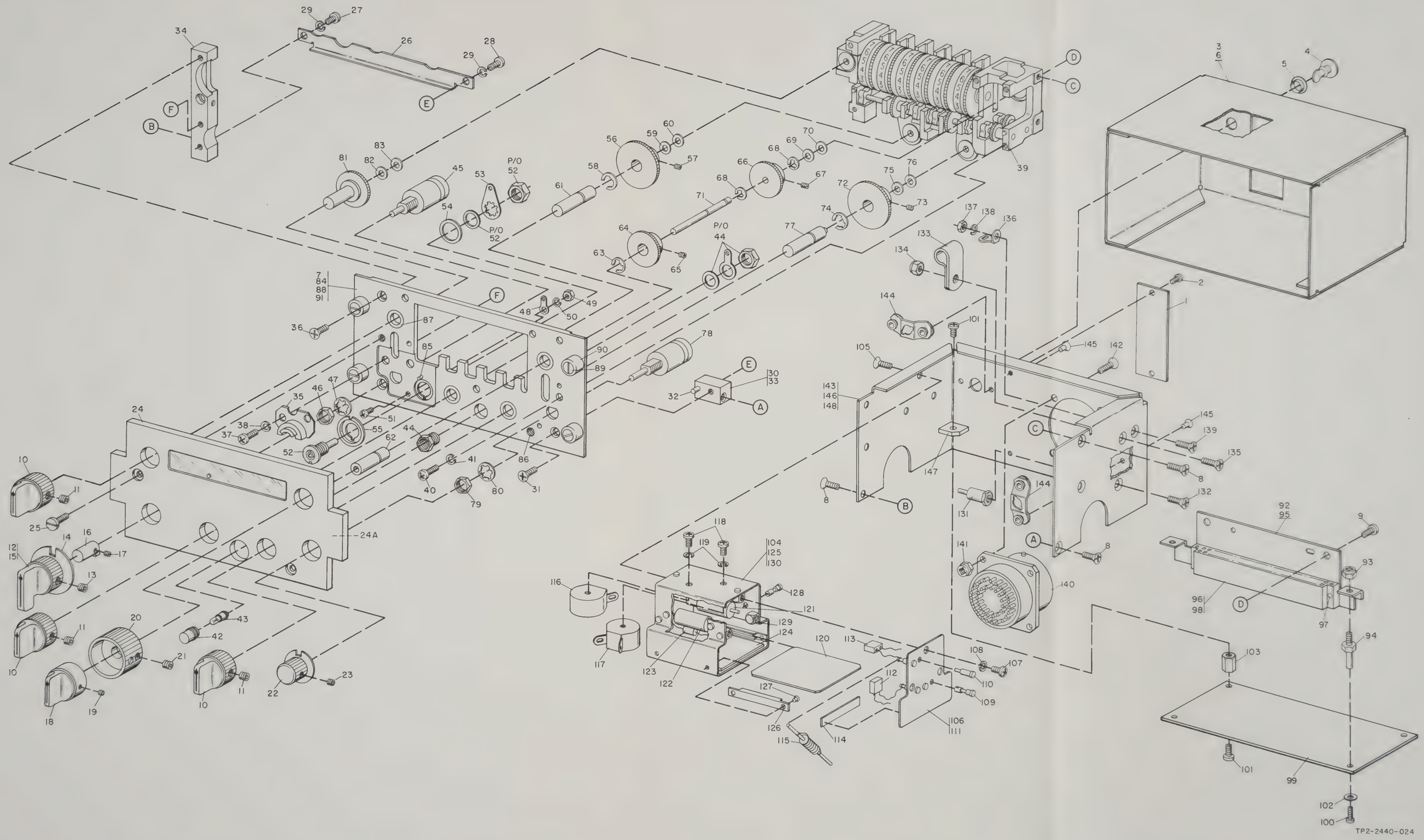
514A-3/4/5 Radio Set Control
Figure 1

1.8 Configuration Identifier

The following configuration identifiers have been assigned in this manual:

CI	UNIT PART NUMBER	FIGURE
71355	792-6121-001	1
71483	792-6122-001	1
71453	792-6123-001	1
71516	792-6122-002	1
70393	793-9264-001	3
70426	797-3523-001	4
71326	609-0681-001	5

2. GROUP ASSEMBLY PARTS LIST



514A-3/4/5 Radio Set Control
Figure 1

GROUP ASSEMBLY PARTS LIST

	FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
	1 -	792-6121-001	1	CONTROL, RADIO SET 514A-3	A	1
	-	792-6122-001	1	CONTROL, RADIO SET 514A-4	B	1
	-	792-6123-001	1	CONTROL, RADIO SET 514A-5	C	1
	-	792-6122-002	1	CONTROL, RADIO SET 514A-4	D	1
	1	778-6637-000	2	PLATE, IDENT	A	1
R	1	778-6602-000	2	PLATE, IDENT	B, D	1
	1	778-6603-000	2	PLATE, IDENT	C	1
	2	P347-1268-000	2	SCREW, MACH, SST, 2-56 X 1/8 (V77250) 347-1268-000 (AP)		2
	3	790-1848-003	2	COVER, PRSD	A	1
R	3	790-1848-001	2	COVER, PRSD	B, D	1
	3	790-1848-002	2	COVER, PRSD	C	1
	4	82-19-100-16	3	STUD, TURNLOCK, FSTNR, CD PL STL, 0.240 DIA X 0.395 (V94222) 012-1502-000		2
	5	82-31-293-25	3	EYELET, TURNLOCK, AL, 0.353 DIA X 0.063 (V75618) 012-1395-000 (AP)		2
	6	790-1847-003	3	COVER	A	1
R	6	790-1847-001	2	COVER	B, D	1
	6	790-1847-002	3	COVER	C	1
	7	790-1829-001	2	PANEL ASSY, FRONT	A, B, C	1
R	7	790-1829-002	2	PANEL ASSY, FRONT	D	1
	8	MS51959-13	3	SCREW, MACH, SST, 4-40 X 1/4 (V96906) 342-0044-000 (AP)		6
	9	MS51957-14	3	SCREW, MACH, STL, 4-40 X 5/16 (V96906) 343-0134-000 (AP)		2
	10	757-0234-001	3	KNOB		3
	11	MS51963-34	3	SETSCREW, CD PL STL, 8-32 X 3/16 (V96906) 328-5043-000 (AP)		6
	12	757-0231-007	3	KNOB		1
	13	MS51963-34	3	SETSCREW, CD PL STL, 8-32 X 3/16 (V96906) 328-5043-000 (AP)		2
	14	757-0220-006	4	SKIRT, KNOB		1
	15	757-0230-001	4	KNOB, POINTER		1
	16	790-2070-001	3	ADAPTER,		1
R				OR		
	16	790-2383-001	3	ADAPTER		1
	17	MS51963-101	3	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
	18	761-4566-002	3	KNOB		1
	19	MS51963-34	3	SETSCREW, BONDED (V96906) 328-5043-000 (AP)		1
	20	778-1527-001	3	KNOB		1
	21	MS51963-34	3	SETSCREW, CD PL STL, 8-32 X 3/16 (V96906) 328-5043-000		2
	22	778-1524-001	3	KNOB		1
	23	MS51963-9	3	SETSCREW, CD PL STL, 4-40 X 1/8 (V96906) 328-5020-000 (AP)		2
	24	790-1838-001	3	PANEL LIGHTING	A, B, C	1
R	24	790-1838-002	3	PANEL LIGHTING	D	1
	24A	MS24367-683	4	LAMP, INCAND, (V96906) 262-0936-000		AR
	25	546-0999-002	3	SCREW, (AP)		2
	26	790-1837-001	3	BRACKET GUIDE, COVER		1
	27	MS51957-13	3	SCREW, MACH, STL, 4-40 X 1/4 (V96906) 343-0133-000 (AP)		1
	28	MS51957-14	3	SCREW, MACH, STL, 4-40 X 5/16 (V96906) 343-0134-000 (AP)		1
	29	MS35338-135	3	WASHER, LOCK, SST, 0.115 ID X 0.209 OD (V96906) 310-0279-000 (AP)		2

GROUP ASSEMBLY PARTS LIST

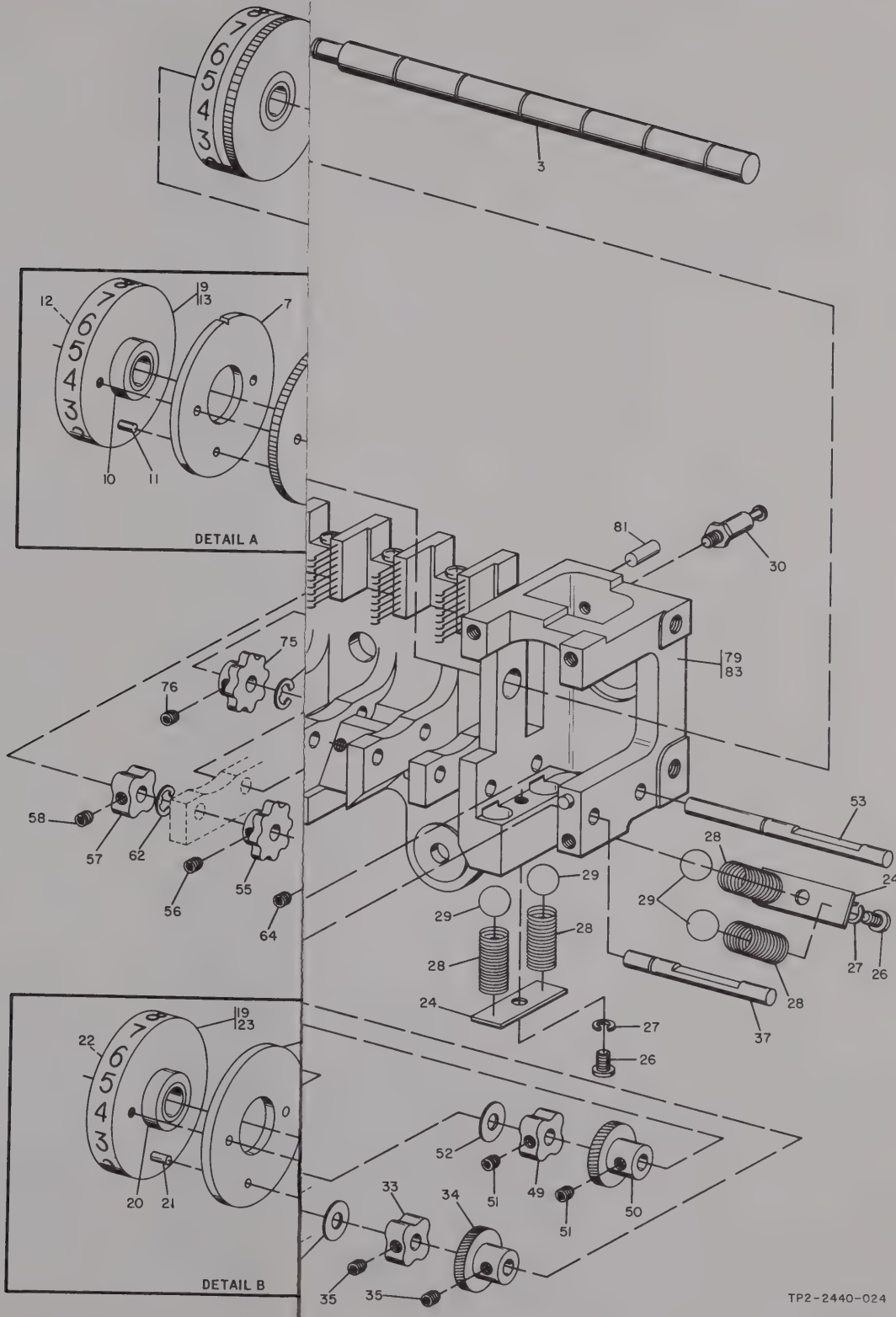
	FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
	1 30	790-1836-001	3	BLOCK,PRSD		1
	31	MS51959-14	3	SCREW,MACH, SST, 4-40 X 5/16 (V96906) 342-0045-000 (AP)		1
	32	MS16562-199	4	PIN,SPR, SST, 0.078 DIA X 1/4 (V96906) 311-0355-000		1
	33	790-1835-001	4	BLOCK		1
	34	790-1834-001	3	BAR,SUPPORT		1
R	35	790-2495-001	3	STOP,SWITCH, (EFF TO CI 70374)	A,B,C	1
R	35	790-2381-001	3	STOP,SWITCH (EFF CI 70374)	A,B,C	1
R	35	790-2381-001	3	STOP,SWITCH	D	1
	36	MS51959-14	3	SCREW,MACH, SST, 4-40 X 5/16 (V96906) 342-0045-000 (AP FOR 34 AND 35)		2
	37	MS51957-14	3	SCREW,MACH, STL, 4-40 X 5/16 (V96906) 343-0134-000 (AP FOR 34 AND 35)		2
	38	MS35338-135	3	WASHER,LOCK, SST, 0.115 ID X 0.209 OD (V96906) 310-0279-000 (AP FOR 34 AND 35)		2
	39	NO NUMBER	3	COUNTER ASSEMBLY (SEE FIG 2)		1
	40	MS51957-14	3	SCREW,MACH, STL, 4-40 X 5/16 (V96906) 343-0134-000 (AP)		5
	41	MS35338-135	3	WASHER,LOCK, SST, 0.115 ID X 0.209 OD (V96906) 310-0279-000 (AP)		5
	42	102203A	3	LIGHT,IND, (V08817) 262-1891-000		1
	43	64	3	LAMP,INCAND, (V17537) 262-2204-090 DS1		1
	44	102231	3	LIGHT,IND, (V08817) 262-1886-000 XDS1		1
	45	259-2769-080	3	SWITCH,ROTARY, (V81349) 259-2769-080 S1		1
	46	P334-0287-00	3	NUT,PLAIN,HEX, SST, 1/4-32 (V77250) 334-0287-000 (AP)		1
	47	MS35333-74	3	WASHER,LOCK, STL, 0.267 ID X 0.478 OD (V96906) 373-0005-000 (AP)		1
	48	4040-2HT	3	TERMINAL,LUG, (V77147) 304-0014-000		1
	49	MS35649-224	3	NUT,PLAIN,HEX, SST, 2-56 (V96906) 313-0037-000 (AP)		1
	50	310-0070-000	3	WASHER,LOCK, SST, 0.097 ID X 0.165 OD (V79807) 310-0070-000 (AP)		1
	51	MS51957-2	3	SCREW,MACH, SST, 2-56 X 3/16 (V96906) 343-0123-000 (AP)		1
	52	MS90335-1	3	CONNECTOR,RCPT, ELEC (V96906) 372-1959-010 J3		1
	53	4422TINNED	3	TERMINAL,LUG, (V71785) 304-0268-000		1
	54	790-2492-001	3	WASHER, (AP FOR 52 AND 53)		1
	55	790-2493-001	3	BUSHING,INSUL, (AP FOR 52 AND 53)		1
	56	778-1521-001	3	GEAR		1
	57	MS51963-101	3	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
	58	5133-25C	3	RING,RTNG, (V79136) 340-0254-000 (AP)		1
	59	500-1128-003	3	WASHER, (AP)		AR
	60	542-7498-003	3	WASHER, (AP)		AR
	61	778-1541-001	3	SHAFT,SHLDR		1
	62	778-1530-001	3	SHAFT		1
	63	5133-25C	3	RING,RTNG, (V79136) 340-0254-000 (AP)		1
	64	778-1510-001	3	GEAR		1
	65	MS51963-101	3	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
	66	778-1510-002	3	GEAR		1
	67	MS51963-101	3	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
	68	5133-12C	3	RING,RTNG, (V79136) 340-0250-000 (AP)		2
	69	500-1128-003	3	WASHER, (AP)		AR
	70	542-7498-003	3	WASHER, (AP)		AR
	71	778-1543-001	3	SHAFT		1
	72	778-1521-001	3	GEAR		1
	73	MS51963-101	3	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		1
	74	5133-25C	3	RING,RTNG, (V79136) 340-0254-000 (AP)		1

GROUP ASSEMBLY PARTS LIST

	FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
1	75	500-1128-003	3	WASHER. (AP)		AR
	76	542-7498-003	3	WASHER. (AP)		AR
	77	778-1541-001	3	SHAFT.SHLDR		1
	78	259-2769-070	3	SWITCH.ROTARY. (V81349) 259-2769-070 S2		1
	79	P334-0287-00	3	NUT.PLAIN.HEX. SST. 1/4-32 (V77250) 334-0287-000 (AP)		1
	80	MS35333-74	3	WASHER.LOCK. STL. 0.267 ID X 0.478 OD (V96906) 373-0005-000 (AP)		1
	81	778-1512-001	3	GEARSHAFT		1
	82	500-1128-003	3	WASHER. (AP)		AR
	83	542-7498-003	3	WASHER. (AP)		AR
	84	790-1833-002	3	PANEL.FRONT. PRESSED		1
	85	MS51923-111	4	PIN.SPRING. SST. 0.031 DIA X 1/8 (V96906) 311-0430-000		1
	86	F22NCFMA2-40	4	NUT.SLFLKG. CD PL STL. 4-40 (V72962) 333-0840-000		2
	87	127-116	4	BEARING.SLV. (V12639) 309-1499-000		4
	88	778-1547-002	4	PANEL.FRONT		1
	89	PC3 1-2CADPLBLK	5	RECEPTACLE.TURN. (V72794) 012-2234-000		4
	90	PFS3 1-2 38CADPL BLK	5	STUD ASSY.TURNL. (V72794) 012-2233-000		4
	91	778-1532-003	5	PANEL		1
	92	790-1845-001	2	BRACKET.CONN.		1
	93	68-1660-40	2	NUT.SLFLKG.HEX. AL. 4-40 (V72962) 333-0605-000 (AP)		2
	94	790-1846-001	2	POST. (AP)		2
	95	790-1844-001	3	BRACKET		1
	96	790-1843-001	3	HOUSING CONN		1
	97	MS16535-16	3	RIVET.TUBULAR. BRS. 0.061 DIA X 0.250 (V96906) 305-1715-000 (AP)		2
	98	372-2254-010	4	HOUSING.CONN CO. 372-2254-010		AR
	99	793-9264-001	2	CONTROL. TRANSMITTER BOARD (SEE FIG 3)		1
	100	LP57D26P4WHQ	2	SCREW.SLFLKG. SST. 2-56 X 1/4 (V03038) 330-2633-000 (AP)		2
	101	MS51957-12	2	SCREW.MACH. STL. 4-40 X 3/16 (V96906) 343-0132-000 (AP)		4
	102	310-0129-000	2	WASHER.FLAT. BRS. 0.089 ID X 0.188 OD (V05411) 310-0129-000 (AP)		2
	103	540-9033-003	2	POST. (AP)		2
R	104	609-0681-001	2	CONVERTER. 15VDC TO 5VDC A1 (EFF CI 71413)(SEE FIG 5)	A.B.C	1
R	104	609-0681-001	2	CONVERTER. 15VDC TO 5VDC A1 (SEE FIG 5)	D	1
R	104	790-2505-001	2	CONVERTER. 15VDC TO 5VDC A1 (EFF TO CI 71413)	A.B.C	1
	105	MS51959-13	2	SCREW.MACH. SST. 4-40 X 1/4 (V96906) 342-0044-000 (AP)		3
	106	790-2502-001	3	COVER PRSD		1
	107	P347-0005-000	3	SCREW.MACH. SST. 4-40 X 3/16 (V77250) 347-0005-000 (AP)		3
	108	310-0278-000	3	WASHER.LOCK. SST. 0.115 ID X 0.202 OD (V70318) 310-0278-000 (AP)		3
R	109	SL441-434WHT	4	TERMINAL.STUD. (V12615) 306-2222-100		2
R	110	SL354-351WHT	4	TERMINAL.FEEDTH. (V12615) 306-2474-010		2
	111	790-2501-001	4	COVER		1
	112	2C067104X0101A3	3	CAPACITOR.FXD. CER DIEL. 0.1UF. 20%. 100V (V56289) 913-4240-040 A1C6		1
	113	2C067104X0101A3	3	CAPACITOR.FXD. CER DIEL. 0.1UF. 20%. 100V (V56289) 913-4240-040 A1C7		1
	114	790-2489-001	3	STRIP.BUMPER		1
	115	778-1860-001	3	COIL. A1L3		1
	116	18095	3	REACTOR. (V07388) 668-0151-010 A1L2		1
	117	18095	3	REACTOR. (V07388) 668-0151-010 A1L1		1
	118	P347-0005-000	3	SCREW.MACH. SST. 4-40 X 3/16 (V77250) 347-0005-000 (AP FOR 114 AND 115)		2

GROUP ASSEMBLY PARTS LIST

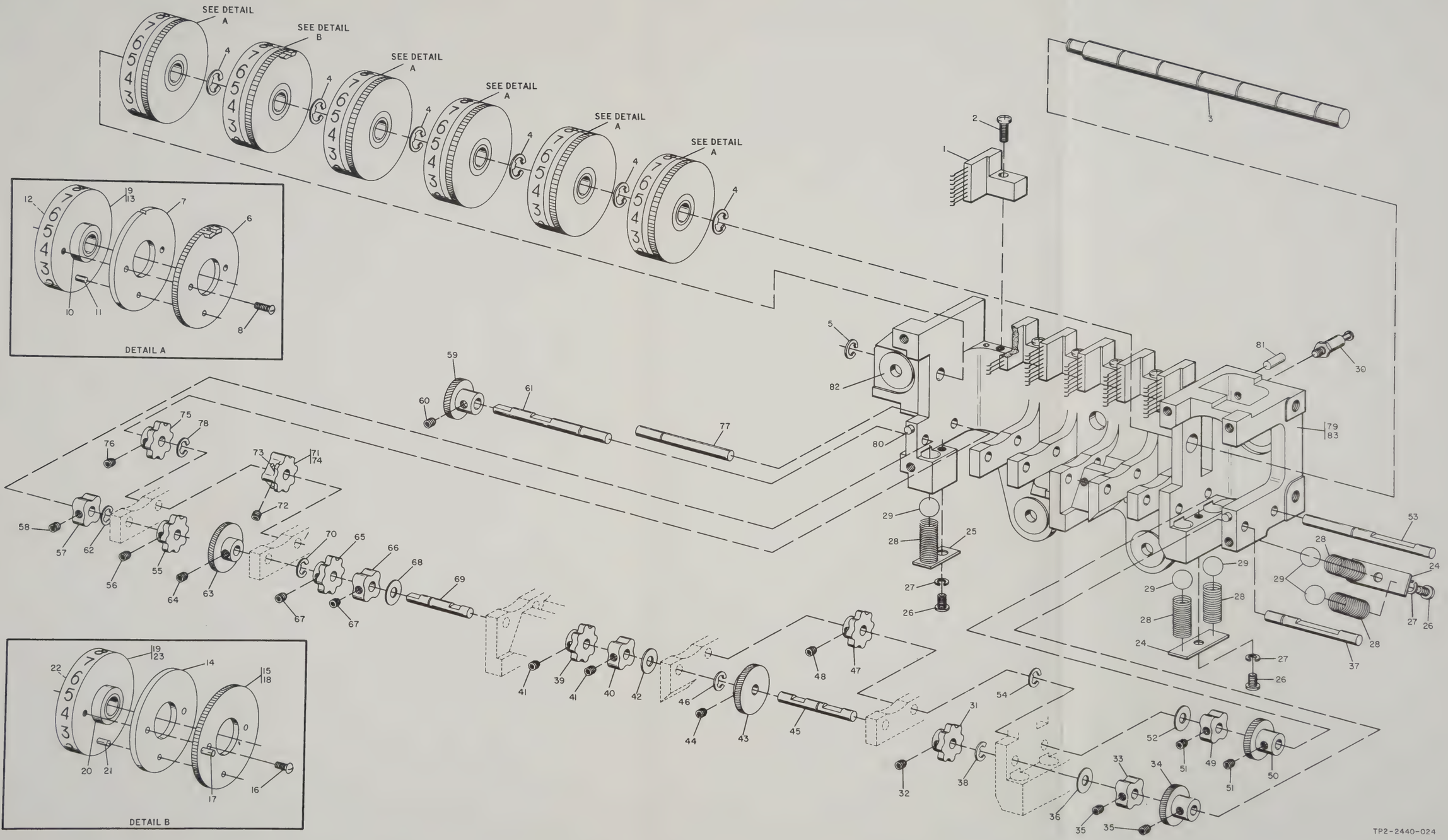
	FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
	1 119	310-0278-000	3	WASHER,LOCK, SST, 0.115 ID X 0.202 OD (V70318) 310-0278-000 (AP FOR 114 AND 115)		2
	120	797-3523-001	3	CIRCIT CARD ASSEMBLY (SEE FIG 4) A1A1		1
	121	150D227X0010S2	3	CAPACITOR,FXD, ELCTLT, 220UF, 20%, 10V (V56289) 184-7419-000 A1C1		1
	122	150D227X0010S2	3	CAPACITOR,FXD, ELCTLT, 220UF, 20%, 10V (V56289) 184-7419-000 A1C2		1
	123	1N753A	3	SEMICOND DEVICE, (V81350) 353-2980-000 A1VR1		1
	124	790-2507-001	3	PLATE,INSULATR		1
	125	790-2500-001	3	CHASSIS PRSD		2
	126	790-2498-001	4	GUIDE,CARD		2
	127	MS20426AD2-2	4	RIVET,SOLID, AL, 1/16 DIA X 1/8 (V96906) 305-1351-000 (AP)		4
	128	SL441-434WHT	4	TERMINAL,STUD, (V12615) 306-2222-100		4
	129	504-7699-001	4	NUT,ANGLE		6
	130	790-2499-001	4	CHASSIS		1
	131	RTMT16M	2	TERMINAL,STUD, (V91663) 306-0977-000	A,C	2
	132	MS51959-13	2	SCREW,MACH, SST, 4-40 X 1/4 (V96906) 342-0044-000 (AP)	A,C	2
	133	HP4N	2	CLAMP,LOOP, (V09922) 150-1541-000		1
	134	68NM40	2	NUT,SLFLKG,HEX, AL, 4-40 (V72962) 333-0347-000 (AP)		1
	135	MS51959-14	2	SCREW,MACH, SST, 4-40 X 5/16 (V96906) 342-0045-000 (AP)		1
	136	403	2	TERMINAL,LUG, (V79963) 304-1089-000		1
	137	P313-0132-000	2	NUT,PLAIN,HEX, SST, 4-40 (V77250) 313-0132-000 (AP)		1
R	138	MS35338-135	2	WASHER,LOCK, SST, 0.115 ID X 0.209 OD (V96906) 310-0279-000 (AP) (EFF TO CI 70306)	A,B,C	1
	139	MS51959-13	2	SCREW,MACH, SST, 4-40 X 1/4 (V96906) 342-0044-000 (AP)		1
	140	MS3102A28-15P	2	CONNECTOR,RCPT, ELEC (V96906) 357-3196-000 J1	A	1
R	140	BT02A20-39P	2	CONNECTOR,RCPT, ELEC (V09922) 371-2363-000 J1	B D	1
	140	PB02A22-55P	2	CONNECTOR,RCPT, ELEC (V77820) 371-1011-000 J1	C	1
	141	68NM40	2	NUT,SLFLKG,HEX, AL, 4-40 (V72962) 333-0347-000 (AP)		4
	142	MS51959-15	2	SCREW,MACH, SST, 4-40 X 3/8 (V96906) 342-0046-000 (AP)		4
	143	790-1850-003	2	CHASSIS ASSY	A	1
R	143	790-1850-001	2	CHASSIS ASSY	B D	1
	143	790-1850-002	2	CHASSIS ASSY	C	1
	144	2-295	3	LOCKSPRING, (V75618) 012-1396-000		2
	145	MS20426AD3-4	3	RIVET,SOLID, AL, 3/32 DIA X 1/4 (V96906) 305-1362-000 (AP)		4
	146	790-2491-003	3	CHASSIS,PRSD	A	1
R	146	790-2491-002	3	CHASSIS,PRSD	B D	1
	146	790-2491-001	3	CHASSIS,PRSD	C	1
	147	790-2491-007	4	EAR		2
	148	790-2491-006	4	CHASSIS	A	1
R	148	790-2491-005	4	CHASSIS	B D	1
	148	790-2491-004	4	CHASSIS	C	1
	2 -	NO NUMBER	1	COUNTER ASSEMBLY (SEE FIG 1-39 FOR NHA)		REF
	1	015-3285-010	2	CONTACT,BRUSH, (V43710) 015-3285-010		6
	2	MS51957-5	2	SCREW,MACH, SST, 2-56 X 3/8 (V96906) 343-0126-000 (AP)		6



Counter Assembly
Figure 2

GROUP ASSEMBLY PARTS LIST

	FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
	1 119	310-0278-000	3	WASHER,LOCK, SST, 0.115 ID X 0.202 OD (V70318) 310-0278-000 (AP FOR 114 AND 115)		2
	120	797-3523-001	3	CIRCIT CARD ASSEMBLY (SEE FIG 4) A1A1		1
	121	150D227X0010S2	3	CAPACITOR,FXD, ELCTLT, 220UF, 20%, 10V (V56289) 184-7419-000 A1C1		1
	122	150D227X0010S2	3	CAPACITOR,FXD, ELCTLT, 220UF, 20%, 10V (V56289) 184-7419-000 A1C2		1
	123	1N753A	3	SEMICOND DEVICE, (V81350) 353-2980-000 A1VR1		1
	124	790-2507-001	3	PLATE,INSULATR		1
	125	790-2500-001	3	CHASSIS PRSD		2
	126	790-2498-001	4	GUIDE,CARD		2
	127	MS20426AD2-2	4	RIVET,SOLID, AL, 1/16 DIA X 1/8 (V96906) 305-1351-000 (AP)		4
	128	SL441-434WHT	4	TERMINAL,STUD, (V12615) 306-2222-100		4
	129	504-7699-001	4	NUT,ANGLE		6
	130	790-2499-001	4	CHASSIS		1
	131	RTMT16M	2	TERMINAL,STUD, (V91663) 306-0977-000	A,C	2
	132	MS51959-13	2	SCREW,MACH, SST, 4-40 X 1/4 (V96906) 342-0044-000 (AP)	A,C	2
	133	HP4N	2	CLAMP,LOOP, (V09922) 150-1541-000		1
	134	68NM40	2	NUT,SLFLKG,HEX, AL, 4-40 (V72962) 333-0347-000 (AP)		1
	135	MS51959-14	2	SCREW,MACH, SST, 4-40 X 5/16 (V96906) 342-0045-000 (AP)		1
	136	403	2	TERMINAL,LUG, (V79963) 304-1089-000		1
	137	P313-0132-000	2	NUT,PLAIN,HEX, SST, 4-40 (V77250) 313-0132-000 (AP)		1
R	138	MS35338-135	2	WASHER,LOCK, SST, 0.115 ID X 0.209 OD (V96906) 310-0279-000 (AP) (EFF TO CI 70306)	A,B,C	1
	139	MS51959-13	2	SCREW,MACH, SST, 4-40 X 1/4 (V96906) 342-0044-000 (AP)		1
	140	MS3102A28-15P	2	CONNECTOR,RCPT, ELEC (V96906) 357-3196-000 J1	A	1
R	140	BT02A20-39P	2	CONNECTOR,RCPT, ELEC (V09922) 371-2363-000 J1	B D	1
	140	PB02A22-55P	2	CONNECTOR,RCPT, ELEC (V77820) 371-1011-000 J1	C	1
	141	68NM40	2	NUT,SLFLKG,HEX, AL, 4-40 (V72962) 333-0347-000 (AP)		4
	142	MS51959-15	2	SCREW,MACH, SST, 4-40 X 3/8 (V96906) 342-0046-000 (AP)		4
	143	790-1850-003	2	CHASSIS ASSY	A	1
R	143	790-1850-001	2	CHASSIS ASSY	B D	1
	143	790-1850-002	2	CHASSIS ASSY	C	1
	144	2-295	3	LOCKSPRING, (V75618) 012-1396-000		2
	145	MS20426AD3-4	3	RIVET,SOLID, AL, 3/32 DIA X 1/4 (V96906) 305-1362-000 (AP)		4
	146	790-2491-003	3	CHASSIS,PRSD	A	1
R	146	790-2491-002	3	CHASSIS,PRSD	B D	1
	146	790-2491-001	3	CHASSIS,PRSD	C	1
	147	790-2491-007	4	EAR		2
	148	790-2491-006	4	CHASSIS	A	1
R	148	790-2491-005	4	CHASSIS	B D	1
	148	790-2491-004	4	CHASSIS	C	1
	2 -	NO NUMBER	1	COUNTER ASSEMBLY (SEE FIG 1-39 FOR NHA)		REF
	1	015-3285-010	2	CONTACT,BRUSH, (V43710) 015-3285-010		6
	2	MS51957-5	2	SCREW,MACH, SST, 2-56 X 3/8 (V96906) 343-0126-000 (AP)		6



Counter Assembly
Figure 2

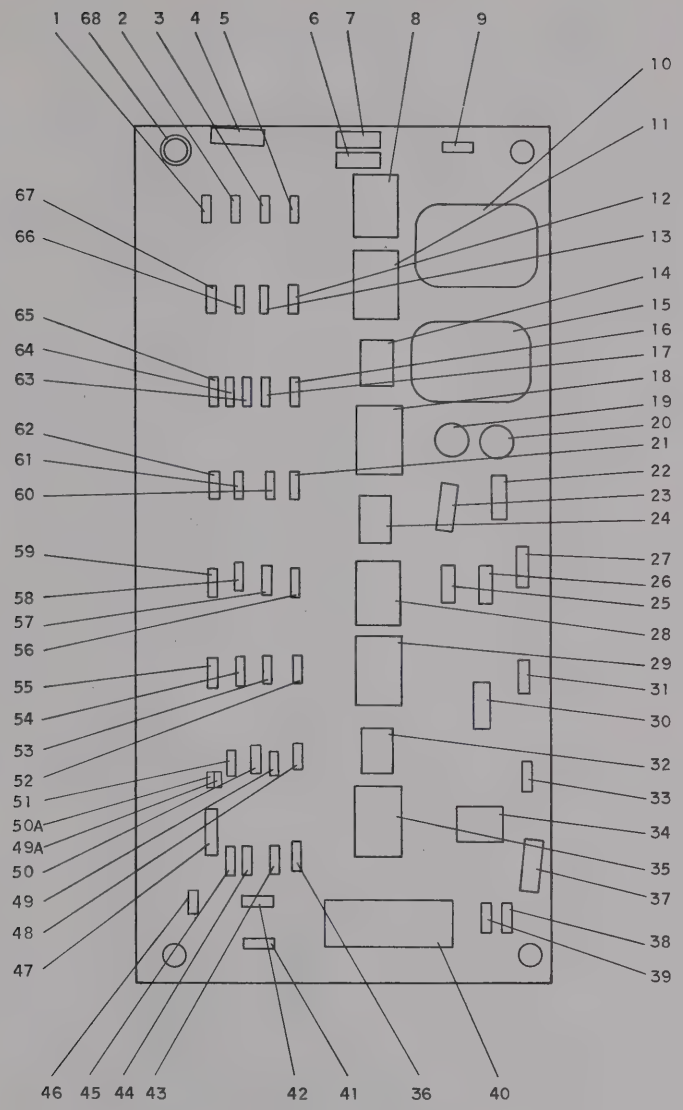
Revised 1 December 1971

GROUP ASSEMBLY PARTS LIST

FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
2 3	778-1533-001	2	SHAFT,SHLDR		1
4	5133-18C	2	RING,RTNG, (V79136) 340-0253-000 (AP)		6
5	MS16632-1012	2	RING,RTNG, (V96906) 340-0112-000 (AP)		1
6	778-1519-001	2	GEAR,SPUR		5
7	778-1509-001	2	SPACER		5
8	P320-0036-000	2	SCREW,MACH, SST, 0-80 X 3/16 (V77250) 320-0036-000 (AP FOR 6 AND 7)		10
9	778-1545-001	2	WHEEL,COUNTER, BONDED		5
10	A205-11C	3	BEARING,SLV, (V70417) 309-0070-000		1
11	MS51923-131	3	PIN,SPRING, SST, 0.047 DIA X 1/4 (V96906) 311-0439-000		1
12	778-1539-001	3	SWITCH PRINTED		1
13	778-1526-001	3	WHEEL COUNTER		1
14	778-1520-001	2	GEAR PRSD		1
15	778-1544-001	2	GEAR		1
16	P320-0036-000	2	SCREW,MACH, SST, 0-80 X 3/16 (V77250) 320-0036-000 (AP FOR 14 AND 15)		2
17	778-1516-001	3	PIN		1
18	778-1538-001	3	GEAR SPUR		1
19	778-1545-001	2	WHEEL,COUNTER		1
20	A205-11C	3	BEARING,SLV, (V70417) 309-0070-000		1
21	MS51923-131	3	PIN,SPRING, SST, 0.047 DIA X 1/4 (V96906) 311-0439-000		1
22	778-1539-001	3	SWITCH,PRINTED		1
23	778-1526-001	3	WHEEL,COUNTER		1
24	778-1513-001	2	PLATE,SPRING		2
25	778-1513-002	2	PLATE,SPRING		1
26	MS51957-13	2	SCREW,MACH, STL, 4-40 X 1/4 (V96906) 343-0133-000 (AP FOR 24 AND 25)		3
27	MS35338-135	2	WASHER,LOCK, SST, 0.115 ID X 0.209 OD (V96906) 310-0279-000 (AP FOR 24 AND 25)		3
28	544-7906-002	2	SPRING		5
29	309-0234-000	2	BEARING,BALL, (V27545) 309-0234-000		5
30	4876-1-0516	2	TERMINAL,FEEDTH, (V71279) 306-2277-000		3
31	778-1511-001	2	GEAR SPUR		1
32	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
33	778-1540-001	2	DETENT WHEEL		1
34	778-1518-001	2	GEAR HELICAL		1
35	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP FOR 34 AND 35)		4
36	543-5579-003	2	WASHER, (AP FOR 34 AND 35)		1
37	778-1535-004	2	SHAFT		1
38	5133-9C	2	RING,RTNG, (V79136) 340-0249-000 (AP)		1
39	778-1511-001	2	GEAR SPUR		1
40	778-1540-001	2	DETENT WHEEL		1
41	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP FOR 39 AND 40)		2
42	543-5579-003	2	WASHER, (AP FOR 39 AND 40)		1
43	778-1517-001	2	GEAR HELICAL		1
44	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
45	778-1535-003	2	SHAFT		1
46	5133-9C	2	RING,RTNG, (V79136) 340-0249-000 (AP)		1
47	778-1511-001	2	GEAR SPUR		1
48	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
49	778-1540-001	2	DETENT WHEEL		1
50	778-1518-001	2	GEAR HELICAL		1
51	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP FOR 49 AND 50)		4
52	543-5579-003	2	WASHER, (AP FOR 49 AND 50)		1
53	778-1535-006	2	SHAFT		1

GROUP ASSEMBLY PARTS LIST

FIG - ITEM		PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
2	54	5133-9C	2	RING,RTNG, (V79136) 340-0249-000 (AP)		1
	55	778-1511-001	2	GEAR SPUR		1
	56	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
	57	778-1541-001	2	DETENT WHEEL		1
	58	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
	59	778-1518-001	2	GEAR HELICAL		1
	60	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
	61	778-1535-001	2	SHAFT		1
	62	5133-9C	2	RING,RTNG, (V79136) 340-0249-000 (AP)		1
	63	778-1517-001	2	GEAR HELICAL		1
	64	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
	65	778-1511-001	2	GEAR SPUR		1
	66	778-1540-001	2	DETENT WHEEL		1
	67	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP FOR 65 AND 66)		2
	68	543-5579-003	2	WASHER, (AP FOR 65 AND 66)		1
	69	778-1535-002	2	SHAFT		1
	70	5133-9C	2	RING,RTNG, (V79136) 340-0249-000 (AP)		1
	71	778-1546-001	2	GEAR PRSD		1
	72	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		1
	73	311-0967-000	3	PIN, SST, 0.0312DIA X 1/8 (V70318) 311-0967-000		1
	74	778-1528-001	3	GEAR		1
	75	778-1511-001	2	GEAR SPUR		1
	76	MS51963-101	2	SETSCREW, CD PL STL, 2-56 X 1/16 (V96906) 328-0370-000 (AP)		2
	77	778-1535-005	2	SHAFT		1
	78	5133-9C	2	RING,RTNG, (V79136) 340-0249-000 (AP)		1
	79	790-1832-001	2	FRAME		1
	80	311-0774-000	3	PIN,STR,HDLS, SST, 0.078 DIA X 3/16 (V70318) 311-0774-000		2
	81	MS16562-199	3	PIN,SPR, SST, 0.078 DIA X 1/4 (V96906) 311-0355-000		2
	82	127-65	3	BEARING,SLV, (V12639) 309-1488-000		4
	83	790-1831-001	3	FRAME,COUNTER		1
3 -		793-9264-001	1	CONTROL, TRANSMITTER BOARD A2 (SEE FIG 1-99 FOR NHA)		REF
	1	RCR05G101K	2	RESISTOR,FXD, CMPSN, 100 OHMS, 10%, 1/8W (V81349) 745-2304-000 A2R1		1
	2	RCR05G101K	2	RESISTOR,FXD, CMPSN, 100 OHMS, 10%, 1/8W (V81349) 745-2304-000 A2R2		1
	3	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R3		1
R	4	CKR06BX104KM	2	CAPACITOR,FXD, CER DIEL, 100,000PF, 10%, 100V (V81349) 913-9008-680 A2C1 (EFF TO CI 72024)		1
R	4	CK06BX104M	2	CAPACITOR,FXD, CER DIEL, 100000PF, 20%, 100V (V81349) 913-5019-780 A2C1 (EFF CI 72024)		1
	5	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R4		1
	6	1N751A	2	SEMICOND DEVICE, (V81350) 353-2978-000 A2VR1		1



Transmitter Board Control
Figure 3

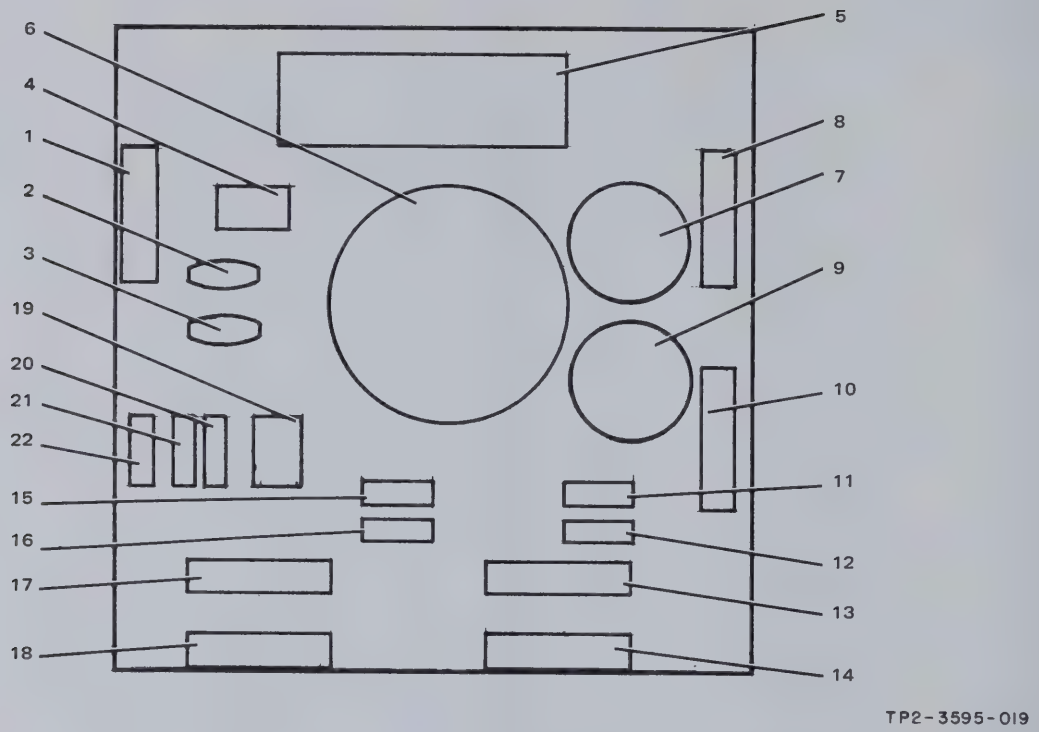
GROUP ASSEMBLY PARTS LIST

	FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
	3 7	1N751A	2	SEMICOND DEVICE. (V81350) 353-2978-000 A2VR2		1
	8	S8281J	2	INTEGRATED CKT. (V18324) 351-7340-020 A2U1		1
	9	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R37		1
	10	CM06FD392G03	2	CAPACITOR.FXD. MICA DIEL. 3900PF. 2%. 500V (V81349) 912-3045-000 A2C4		1
	11	U3L931251	2	INTEGRATED CKT. (V07263) 351-7430-010 A2U2		1
	12	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R8		1
	13	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R7		1
	14	SF101	2	INTEGRATED CKT. (V93332) 351-7297-020 A2U3		1
	15	CM06FD392G03	2	CAPACITOR.FXD. MICA DIEL. 3900PF. 2%. 500V (V81349) 912-3045-000 A2C3		1
	16	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R38		1
	17	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R12		1
	18	U3L931251	2	INTEGRATED CKT. (V07263) 351-7430-010 A2U4		1
	19	2N2222A	2	TRANSISTOR. (V81350) 352-7500-280 A2Q2		1
	20	2N2222A	2	TRANSISTOR. (V81350) 352-7500-280 A2Q1		1
	21	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R16		1
	22	RN55D3482F	2	RESISTOR.FXD. FILM. 34.8K. 1%. 1/8W (V81349) 705-1070-000 A2R35		1
	23	RN55D3482F	2	RESISTOR.FXD. FILM. 34.8K. 1%. 1/8W (V81349) 705-1070-000 A2R34		1
	24	RG371K	2	INTEGRATED CKT. (V49956) 351-7495-020 A2U5		1
	25	1N914	2	SEMICOND DEVICE. (V81350) 353-3338-000 A2CR3		1
	26	1N914	2	SEMICOND DEVICE. (V81350) 353-3338-000 A2CR4		1
	27	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R36		1
	28	S8281J	2	INTEGRATED CKT. (V18324) 351-7340-020 A2U6		1
	29	U3L931251	2	INTEGRATED CKT. (V07263) 351-7430-010 A2U7		1
	30	RCR07G100KS	2	RESISTOR.FXD. CMPSN. 10 OHMS. 10%. 1/4W (V81349) 745-0677-000 A2R40		1
	31	1N914	2	SEMICOND DEVICE. (V81350) 353-3338-000 A2CR6		1
	32	SG141	2	INTEGRATED CKT. (V93332) 351-7093-020 A2U8		1
	33	1N914	2	SEMICOND DEVICE. (V81350) 353-3338-000 A2CR5		1
	34	SG51	2	INTEGRATED CKT. (V93332) 351-7079-020 A2U11		1
	35	U3L931251	2	INTEGRATED CKT. (V07263) 351-7430-010 A2U9		1
	36	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R32		1
R	37	CKR06BX104KM	2	CAPACITOR.FXD. CER DIEL. 100,000PF. 10%. 100V (V81349) 913-9008-680 A2C2 (EFF TO CI 72024)		1
R	37	CK06BX104M	2	CAPACITOR.FXD. CER DIEL. 100000PF. 20%. 100V (V81349) 913-5019-780 A2C2 (EFF CI 72024)		1
	38	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R33		1
	39	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R39		1
	40	DM7830D	2	INTEGRATED CKT. (V27014) 351-7457-010 A2U10		1
	41	1N914	2	SEMICOND DEVICE. (V81350) 353-3338-000 A2CR1		1
	42	1N914	2	SEMICOND DEVICE. (V81350) 353-3338-000 A2CR2		1
	43	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R31		1
	44	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R30		1
	45	RCR05G392K	2	RESISTOR.FXD. CMPSN. 3.9K. 10%. 1/8W (V81349) 745-2362-000 A2R29		1
R	46	CKR06BX104KM	2	CAPACITOR.FXD. CER DIEL. 100,000PF. 10%. 100V (V81349) 913-9008-680 A2C5 (EFF TO CI 71346)		1

GROUP ASSEMBLY PARTS LIST

	FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
	3 47	RCR07G100KS	2	RESISTOR,FXD, CMPSN, 10 OHMS, 10%, 1/4W (V81349) 745-0677-000 A2R41		1
	48	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R28		1
	49	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R27		1
R	49A	8123-501W5R122M	2	CAPACITOR,FXD, CER DIEL, 1200PF, 20%, 75V (V72982) 913-4496-240 A2C6 (EFF CI 71346 TO CI 71383)		1
R	49A	K05SK102K	2	CAPACITOR,FXD, CER DIEL, 1000PF, 10%, 100V (V05397) 913-4489-080 A2C6 (EFF CI 71383)		1
	50	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R26		1
R	50A	8123-501W5R122M	2	CAPACITOR,FXD, CER DIEL, 1200PF, 20%, 75V (V72982) 913-4496-240 A2C5 (EFF CI 71346 TO CI 71383)		1
R	50A	K05SK102K	2	CAPACITOR,FXD, CER DIEL, 1000PF, 10%, 100V (V05397) 913-4489-080 A2C5 (EFF CI /1383)		1
	51	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R25		1
	52	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R24		1
	53	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R23		1
	54	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R22		1
	55	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R21		1
	56	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R20		1
	57	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R19		1
	58	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R18		1
	59	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R17		1
	60	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R15		1
	61	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R14		1
	62	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R13		1
	63	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R11		1
	64	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R10		1
	65	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R9		1
	66	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R6		1
	67	RCR05G392K	2	RESISTOR,FXD, CMPSN, 3.9K, 10%, 1/8W (V81349) 745-2362-000 A2R5		1
	68	778-9422-015	2	SLEEVE, CARD SPACING		2
	4 -	797-3523-001	1	CIRCUIT CARD ASSEMBLY A1A1 (SEE FIG 1-120 OR 5-10 FOR NHA)		REF
	1	RCR07G153KS	2	RESISTOR,FXD, CMPSN, 15K, 10%, 1/4W (V81349) 745-0791-000 A1A1R1		1
	2	2C067104X0101A3	2	CAPACITOR,FXD, CER DIEL, 0.1UF, 20%, 100V (V56289) 913-4240-040 A1A1C4		1

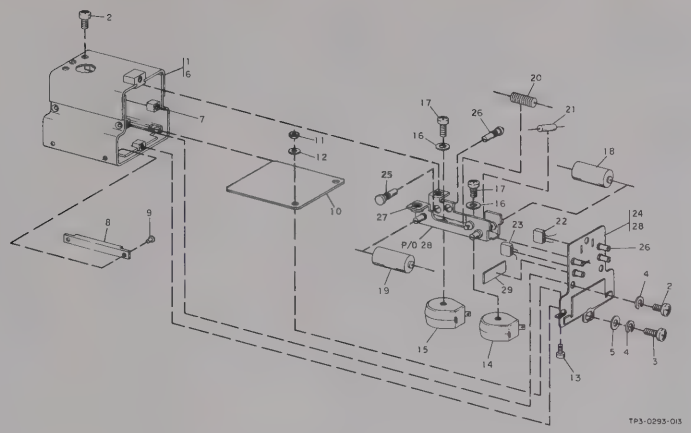
GROUP ASSEMBLY PARTS LIST



Circuit Card Assembly
Figure 4

FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
4 3	2C067104X0101A3	2	CAPACITOR,FXD, CER DIEL, 0.1UF, 20%, 100V (V56289) 913-4240-040 A1A1C5		1
4	1N5415	2	SEMICOND DEVICE, (V07688) 353-6558-010 A1A1CR1		1
5	600D826G030DD5	2	CAPACITOR,FXD, ELCTLT, 82UF, M10%P75%, 30V (V56289) 183-1277-240 A1A1C3		1
6	790-2514-001	2	TRANSFORMER, A1A1T1		1
7	2N3019	2	TRANSISTOR, (V07688) 352-0734-010 A1A1Q2		1
8	1N973B	2	SEMICOND DEVICE, (V81350) 353-3095-000 A1A1CR4		1
9	2N3019	2	TRANSISTOR, (V07688) 352-0734-010 A1A1Q1		1
10	1N973B	2	SEMICOND DEVICE, (V81350) 353-3095-000 A1A1CR3		1
11	1N3064	2	SEMICOND DEVICE, (V07688) 353-3404-000 A1A1CR9		1
12	1N3064	2	SEMICOND DEVICE, (V07688) 353-3404-000 A1A1CR8		1
13	RN60D5110F	2	RESISTOR,FXD, FILM, 511 OHMS, 1%, 1/4W (V81349) 705-6582-000 A1A1R5		1
14	RN60D1000F	2	RESISTOR,FXD, FILM, 100 OHMS, 1%, 1/4W (V81349) 705-6548-000 A1A1R4		1
15	1N3064	2	SEMICOND DEVICE, (V07688) 353-3404-000 A1A1CR6		1
16	1N3064	2	SEMICOND DEVICE, (V07688) 353-3404-000 A1A1CR5		1
17	RN60D1000F	2	RESISTOR,FXD, FILM, 100 OHMS, 1%, 1/4W (V81349) 705-6548-000 A1A1R3		1
18	RN60D5110F	2	RESISTOR,FXD, FILM, 511 OHMS, 1%, 1/4W (V81349) 705-6582-000 A1A1R2		1
19	1N5415	2	SEMICOND DEVICE, (V07688) 353-6558-010 A1A1CR2		1
20	1N3064	2	SEMICOND DEVICE, (V07688) 353-3404-000 A1A1CR7		1
21	1N3064	2	SEMICOND DEVICE, (V07688) 353-3404-000 A1A1CR11		1
22	1N3064	2	SEMICOND DEVICE, (V07688) 353-3404-000 A1A1CR10		1

GROUP ASSEMBLY PARTS LIST



Converter, 15 VDC to 5 VDC
Figure 5

FIG - ITEM	PART NO	INDENT	DESCRIPTION	USABLE ON CODE	UNITS PER ASSY
5 -	609-0681-001	1	CONVERTER,15VDC TO 5VDC A1 (SEE 1-104 FOR NHA)		REF
1	609-0678-001	2	CHASSIS,SHIELDING		1
2	MS51957-12	2	SCREW,MACH, STL, 4-40 X 3/16 (V96906) 343-0132-000 (AP)		5
3	MS51957-13	2	SCREW,MACH, STL, 4-40 X 1/4 (V96906) 343-0133-000 (AP)		1
4	MS35338-135	2	WASHER,LOCK, SST, 0.115 ID X 0.209 OD (V96906) 310-0279-000 (AP)		4
5	310-0045-000	2	WASHER,FLAT, SST, 0.125 ID X 0.312 OD (V79807) 310-0045-000 (AP)		1
6	609-0677-001	3	CHASSIS SHIELD		1
7	504-7699-002	3	NUT,ANGLE		6
8	790-2498-001	3	GUIDE,CARD		2
9	MS20426AD2-2	3	RIVET,SOLID, AL, 1/16 DIA X 1/8 (V96906) 305-1351-000 (AP)		4
10	797-3523-001	2	CARD CIRCUIT ASSEMBLY (SEE FIG 4)		1
11	P313-0166-000	2	NUT,PLAIN,HEX, NP BRS, 0-80 (V77250) 313-0166-000 (AP)		2
12	609-0680-001	2	WASHER,FLAT (AP)		2
13	P321-0291-000	2	SCREW,MACH, NP BRS, 0-80 X 3/16 (V77250) 321-0291-000 (AP)		2
14	18095	2	REACTOR, (V07388) 668-0151-010 A1L1		1
15	18095	2	REACTOR, (V07388) 668-0151-010 A1L2		1
16	MS51957-12	2	SCREW,MACH, STL, 4-40 X 3/16 (V96906) 343-0132-000 (AP FOR 14,15)		2
17	MS35338-135	2	WASHER,LOCK, SST, 0.115 ID X 0.209 OD (V96906) 310-0279-000 (AP FOR 14,15)		2
18	150D227X0010S2	2	CAPACITOR,FXD, ELCTLT, 220UF, 20%, 10V (V56289) 184-7419-000 A1C1		1
19	150D227X0010S2	2	CAPACITOR,FXD, ELCTLT, 220UF, 20%, 10V (V56289) 184-7419-000 A1C2		1
20	778-1860-001	2	COIL A1L3		1
21	1N753A	2	SEMICOND DEVICE, (V81350) 353-2980-000 A1VR1		1
22	2C067104X0101A3	2	CAPACITOR,FXD, CER DIEL, 0.1UF, 20%, 100V (V56289) 913-4240-040 A1C6		1
23	2C067104X0101A3	2	CAPACITOR,FXD, CER DIEL, 0.1UF, 20%, 100V (V56289) 913-4240-040 A1C7		1
24	609-0679-001	2	CHASSIS		1
25	SL439-433WHT	3	TERMINAL,STDF, (V12615) 306-1521-000		3
26	SL304-301WHT	3	TERMINAL,FEEDTH, (V12615) 306-1851-000		7
27	F22NCFMA2-40	3	NUT,SLFLKG, CD PL STL, 4-40 (V72962) 333-0840-000		2
28	609-0676-001	3	CHASSIS		1
29	609-0675-001	4	PLATE,INSULATOR		1

3. NUMERICAL INDEX

PART NUMBER	FIG - ITEM	TTL REQ
A205-11C	2-10	1
	2-20	1
BT02A20-39P	1-140	1
CKR06BX104KM	3-4	1
	3-37	1
	3-46	1
CK06BX104M	3-4	1
	3-37	1
CM06FD392G03	3-10	1
	3-15	1
DM7830D	3-40	1
F22NCFMA2-40	1-86	2
	5-27	2
HP4N	1-133	1
K05SK102K	3-49A	1
	3-50A	1
LP57D26P4WHQ	1-100	2
MS16535-16	1-97	2
MS16562-199	1-32	1
	2-81	2
MS16632-1012	2-5	1
MS20426AD2-2	1-127	4
	5-9	4
MS20426AD3-4	1-145	4
MS24367-683	1-24A	AR
MS3102A28-15P	1-140	1
MS35333-74	1-47	1
	1-80	1
MS35338-135	1-29	2
	1-38	2
	1-41	5
	1-138	1
	2-27	3
	5-4	4
	5-17	2
MS35649-224	1-49	1
MS51923-111	1-85	1
MS51923-131	2-11	1
	2-21	1
MS51957-12	1-101	4
	5-2	5
	5-16	2
MS51957-13	1-27	1
	2-26	3
	5-3	1
MS51957-14	1-9	2
	1-28	1
	1-37	2
	1-40	5
MS51957-2	1-51	1
MS51957-5	2-2	6
MS51959-13	1-8	6
	1-105	3
	1-132	2
	1-139	1
MS51959-14	1-31	1
	1-36	2
	1-135	1
MS51959-15	1-142	4
MS51963-101	1-17	2
	1-57	2
	1-65	2
	1-67	2
	1-73	1
	2-32	2
	2-35	4
	2-41	2

PART NUMBER	FIG - ITEM	TTL REQ
	2-44	2
	2-48	2
	2-51	4
	2-56	2
	2-58	2
	2-60	2
	2-64	2
	2-67	2
	2-72	1
	2-76	2
MS51963-34	1-11	6
	1-13	2
	1-19	1
	1-21	2
MS51963-9	1-23	2
MS90335-1	1-52	1
P802A22-55P	1-140	1
PC3 1-2CADPLBLK	1-89	4
PFS3 1-2 38CADPL BLK	1-90	4
P313-0132-000	1-137	1
P313-0166-000	5-11	2
P320-0036-000	2-8	10
	2-16	2
P321-0291-000	5-13	2
P334-0287-00	1-46	1
	1-79	1
P347-0005-000	1-107	3
	1-118	2
P347-1268-000	1-2	2
RCR05G101K	3-1	1
	3-2	1
RCR05G392K	3-3	1
	3-5	1
	3-9	1
	3-12	1
	3-13	1
	3-16	1
	3-17	1
	3-21	1
	3-27	1
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	3-58	1
	3-59	1
	3-60	1
	3-61	1
	3-62	1
	3-63	1
	3-64	1
	3-65	1
	3-66	1
	3-67	1

NUMERICAL INDEX

PART NUMBER	FIG - ITEM	TTL REQ
RCR07G100KS	3-30	1
	3-47	1
RCR07G153KS	4-1	1
RG371K	3-24	1
RN55D3482F	3-22	1
	3-23	1
RN60D1000F	4-14	1
	4-17	1
RN60D5110F	4-13	1
	4-18	1
RTMT16M	1-131	2
SF101	3-14	1
SG141	3-32	1
SG51	3-34	1
SL304-301WHT	5-26	7
SL354-351WHT	1-110	2
SL439-433WHT	5-25	3
SL441-434WHT	1-109	2
	1-128	4
S8281J	3-8	1
	3-28	1
U3L931251	3-11	1
	3-18	1
	3-29	1
	3-35	1
015-3285-010	2-1	6
1N3064	4-11	1
	4-12	1
	4-15	1
	4-16	1
	4-20	1
	4-21	1
	4-22	1
1N5415	4-4	1
	4-19	1
1N751A	3-6	1
	3-7	1
1N753A	1-123	1
	5-21	1
1N914	3-25	1
	3-26	1
	3-31	1
	3-33	1
	3-41	1
	3-42	1
1N973B	4-8	1
	4-10	1
102203A	1-42	1
102231	1-44	1
127-116	1-87	4
127-65	2-82	4
150D227X0010S2	1-121	1
	1-122	1
	5-18	1
	5-19	1
18095	1-116	1
	1-117	1
	5-14	1
	5-15	1
2-295	1-144	2
2C067104X0101A3	1-112	1
	1-113	1
	4-2	1
	4-3	1
	5-22	1
	5-23	1

PART NUMBER	FIG - ITEM	TTL REQ
2N2222A	3-19	1
	3-20	1
2N3019	4-7	1
	4-9	1
259-2769-070	1-78	1
259-2769-080	1-45	1
309-0234-000	2-29	5
310-0045-000	5-5	1
310-0070-000	1-50	1
310-0129-000	1-102	2
310-0278-000	1-108	3
	1-119	2
311-0774-000	2-80	2
311-0967-000	2-73	1
372-2254-010	1-98	AR
403	1-136	1
4040-2HT	1-48	1
4422TINNED	1-53	1
4876-1-0516	2-30	3
500-1128-003	1-59	AR
	1-69	AR
	1-75	AR
	1-82	AR
504-7699-001	1-129	6
504-7699-002	5-7	6
5133-12C	1-68	2
5133-18C	2-4	6
5133-25C	1-58	1
	1-63	1
	1-74	1
5133-9C	2-38	1
	2-46	1
	2-54	1
	2-62	1
	2-70	1
	2-78	1
540-9033-003	1-103	2
542-7498-003	1-60	AR
	1-70	AR
	1-76	AR
	1-83	AR
543-5579-003	2-36	1
	2-42	1
	2-52	1
	2-68	1
544-7906-002	2-28	5
546-0999-002	1-25	2
600D826G030DD5	4-5	1
609-0675-001	5-29	1
609-0676-001	5-28	1
609-0677-001	5-6	1
609-0678-001	5-1	1
609-0679-001	5-24	1
609-0680-001	5-12	2
609-0681-001	1-104	1
	1-104	1
	5-	REF
64	1-43	1
68-1660-40	1-93	2
68NM40	1-134	1
	1-141	4
757-0220-006	1-14	1
757-0230-001	1-15	1
757-0231-007	1-12	1
757-0234-001	1-10	3
761-4566-002	1-18	1

NUMERICAL INDEX

PART NUMBER	FIG - ITEM	TTL REQ
778-1509-001	2-7	5
778-1510-001	1-64	1
778-1510-002	1-66	1
778-1511-001	2-31	1
	2-39	1
	2-47	1
	2-55	1
	2-65	1
	2-75	1
778-1512-001	1-81	1
778-1513-001	2-24	2
778-1513-002	2-25	1
778-1516-001	2-17	1
778-1517-001	2-43	1
	2-63	1
778-1518-001	2-34	1
	2-50	1
	2-59	1
778-1519-001	2-6	5
778-1520-001	2-14	1
778-1521-001	1-56	1
	1-72	1
778-1524-001	1-22	1
778-1526-001	2-13	1
	2-23	1
778-1527-001	1-20	1
778-1528-001	2-74	1
778-1530-001	1-62	1
778-1532-003	1-91	1
778-1533-001	2-3	1
778-1535-001	2-61	1
778-1535-002	2-69	1
778-1535-003	2-45	1
778-1535-004	2-37	1
778-1535-005	2-77	1
778-1535-006	2-53	1
778-1538-001	2-18	1
778-1539-001	2-12	1
	2-22	1
778-1540-001	2-33	1
	2-40	1
	2-49	1
	2-66	1
778-1541-001	1-61	1
	1-77	1
	2-57	1
778-1543-001	1-71	1
778-1544-001	2-15	1
778-1545-001	2-9	5
	2-19	1
778-1546-001	2-71	1
778-1547-002	1-88	1
778-1860-001	1-115	1
	5-20	1
778-6602-000	1-1	1
778-6603-000	1-1	1
778-6637-000	1-1	1
778-9422-015	3-68	2
790-1829-001	1-7	1
790-1829-002	1-7	1
790-1831-001	2-83	1
790-1832-001	2-79	1
790-1833-002	1-84	1
790-1834-001	1-34	1
790-1835-001	1-33	1

PART NUMBER	FIG - ITEM	TTL REQ
790-1836-001	1-30	1
790-1837-001	1-26	1
790-1838-001	1-24	1
790-1838-002	1-24	1
790-1843-001	1-96	1
790-1844-001	1-95	1
790-1845-001	1-92	1
790-1846-001	1-94	2
790-1847-001	1-6	1
790-1847-002	1-6	1
790-1847-003	1-6	1
790-1848-001	1-3	1
790-1848-002	1-3	1
790-1848-003	1-3	1
790-1850-001	1-143	1
790-1850-002	1-143	1
790-1850-003	1-143	1
790-2070-001	1-16	1
790-2381-001	1-35	1
	1-35	1
790-2383-001	1-16	1
790-2489-001	1-114	1
790-2491-001	1-146	1
790-2491-002	1-146	1
790-2491-003	1-146	1
790-2491-004	1-148	1
790-2491-005	1-148	1
790-2491-006	1-148	1
790-2491-007	1-147	2
790-2492-001	1-54	1
790-2493-001	1-55	1
790-2495-001	1-35	1
790-2498-001	1-126	2
	5-8	2
790-2499-001	1-130	1
790-2500-001	1-125	2
790-2501-001	1-111	1
790-2502-001	1-106	1
790-2505-001	1-104	1
790-2507-001	1-124	1
790-2514-001	4-6	1
792-6121-001	1-0	1
792-6122-001	1-0	1
792-6122-002	1-	1
792-6123-001	1-0	1
793-9264-001	1-99	1
	3-0	REF
797-3523-001	1-120	1
	4-0	REF
	5-10	1
8123-501W5R122M	3-49A	1
	3-50A	1
82-19-100-16	1-4	2
82-31-293-25	1-5	2

4. REFERENCE DESIGNATION INDEX

REFERENCE DESIGNATION	FIG - ITEM	PART NUMBER
A1	5-	609-0681-001
A1	1-104	790-2505-001
A1	1-104	609-0681-001
A1	1-104	609-0681-001
A1A1	4-	797-3523-001
A1A1CR1	4-4	1N5415
A1A1CR10	4-22	1N3064
A1A1CR11	4-21	1N3064
A1A1CR2	4-19	1N5415
A1A1CR5	4-16	1N3064
A1A1CR6	4-15	1N3064
A1A1CR7	4-20	1N3064
A1A1CR8	4-12	1N3064
A1A1CR9	4-11	1N3064
A1A1C3	4-5	600D826G030DD5
A1A1C4	4-2	2C067104X0101A3
A1A1C5	4-3	2C067104X0101A3
A1A1Q1	4-9	2N3019
A1A1Q2	4-7	2N3019
A1A1R1	4-1	RCR07G153KS
A1A1R2	4-18	RN60D5110F
A1A1R3	4-17	RN60D1000F
A1A1R4	4-14	RN60D1000F
A1A1R5	4-13	RN60D5110F
A1A1T1	4-6	790-2514-001
A1A1VR1	4-10	1N973B
A1A1VR2	4-8	1N973B
A1C1	5-18	150D227X0010S2
A1C1	1-121	150D227X0010S2
A1C2	5-19	150D227X0010S2
A1C2	1-122	150D227X0010S2
A1C6	5-22	2C067104X0101A3
A1C6	1-112	2C067104X0101A3
A1C7	5-23	2C067104X0101A3
A1C7	1-113	2C067104X0101A3
A1L1	5-14	18095
A1L1	1-117	18095
A1L2	5-15	18095
A1L2	1-116	18095
A1L3	5-20	778-1860-001
A1L3	1-115	778-1860-001
A1VR2	5-21	1N753A
A1VR3	1-123	1N753A
A2	3-0	793-9264-001
A2CR1	3-41	1N914
A2CR2	3-42	1N914
A2CR3	3-25	1N914
A2CR4	3-26	1N914
A2CR5	3-33	1N914
A2CR6	3-31	1N914
A2C1	3-4	CK06BX104M
A2C1	3-4	CKR06BX104KM
A2C2	3-37	CKR06BX104KM
A2C2	3-37	CK06BX104M
A2C3	3-15	CM06FD392G03
A2C4	3-10	CM06FD392G03
A2C5	3-46	CKR06BX104KM
A2C5	3-50A	8123-501W5R122M
A2C5	3-50A	K05SK102K
A2C6	3-49A	8123-501W5R122M
A2C6	3-49A	K05SK102K
A2Q1	3-20	2N2222A
A2Q2	3-19	2N2222A
A2R1	3-1	RCR05G101K
A2R10	3-64	RCR05GJ92K
A2R11	3-63	RCR05GJ92K
A2R12	3-17	RCR05GJ92K
A2R13	3-62	RCR05GJ92K
A2R14	3-61	RCR05GJ92K
A2R15	3-60	RCR05GJ92K
A2R16	3-21	RCR05GJ92K
A2R17	3-59	RCR05GJ92K
A2R18	3-58	RCR05GJ92K
A2R19	3-57	RCR05GJ92K
A2R2	3-2	RCR05G101K
A2R20	3-56	RCR05GJ92K
A2R21	3-55	RCR05GJ92K
A2R22	3-54	RCR05GJ92K
A2R23	3-53	RCR05GJ92K
A2R24	3-52	RCR05GJ92K
A2R25	3-51	RCR05GJ92K
A2R26	3-50	RCR05GJ92K
A2R27	3-49	RCR05GJ92K
A2R28	3-48	RCR05GJ92K
A2R29	3-45	RCR05GJ92K
A2R3	3-3	RCR05GJ92K
A2R30	3-44	RCR05GJ92K
A2R31	3-43	RCR05GJ92K
A2R32	3-36	RCR05GJ92K
A2R33	3-38	RCR05GJ92K
A2R34	3-23	RN55D3482F
A2R35	3-22	RN55D3482F
A2R36	3-27	RCR05GJ92K
A2R37	3-9	RCR05GJ92K
A2R38	3-16	RCR05GJ92K
A2R39	3-39	RCR05GJ92K
A2R4	3-5	RCR05GJ92K
A2R40	3-30	RCR07G100KS
A2R41	3-47	RCR07G100KS
A2R5	3-67	RCR05GJ92K
A2R6	3-66	RCR05GJ92K
A2R7	3-13	RCR05GJ92K
A2R8	3-12	RCR05GJ92K
A2R9	3-65	RCR05GJ92K
A2U1	3-8	S8281J
A2U10	3-40	DM7830D
A2U11	3-34	SG51
A2U2	3-11	U3L931251
A2U3	3-14	SF101
A2U4	3-18	U3L931251
A2U5	3-24	RG371K
A2U6	3-28	S8281J
A2U7	3-29	U3L931251
A2U8	3-32	SG141
A2U9	3-35	U3L931251
A2VR1	3-6	1N751A
A2VR2	3-7	1N751A
DS1	1-43	64
J1	1-140	BT02A20-39P
J1	1-140	PB02A22-55P
J1	1-140	MS3102A28-15P
J3	1-52	MS90335-1
S1	1-45	259-2769-080
S2	1-78	259-2769-070
XDS1	1-44	102231

514A-3/4/5
Radio Set Control

COLLINS

diagrams

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list of illustrations

Figure		*Page*
1	514A-3/4/5 Radio Set Control, Outline and Mounting Dimensions Diagram	3
2	514A-3/4/5 Radio Set Control, Schematic Diagram	5
3	Modulo-Two Transmit Circuit Card A2 (CI-70393 and Up), Schematic Diagram	9
4	Modulo-Two Transmit Circuit Card A2 (No Effectivity), Schematic Diagram	13

NOTICE: This section replaces second edition dated 15 June 1970.

List of Effective Pages

*The asterisk indicates pages changed, added, or deleted by the current change.

Page No	Issue
*Tab Divider	15 Dec 71
*Title	15 Dec 71
*A	15 Dec 71
*Rec of Rev	15 Dec 71
*1	15 Dec 71
2 Blank	1 Jan 70
*3	15 Dec 71
4 Blank	1 Jan 70
*5	15 Dec 71
6 Blank	1 Jan 70
*7	15 Dec 71
8 Blank	1 Jan 70
*9	15 Dec 71
10 Blank	1 Jan 70
*11	15 Dec 71
12 Blank	1 Jan 70
*13	15 Dec 71
14 Blank	1 Jan 70
*15	15 Dec 71
16 Blank	1 Jan 70

Record of Revisions

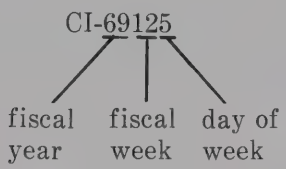
RETAIN THIS RECORD IN THE FRONT OF MANUAL.
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL,
AND ENTER DATE INSERTED AND INITIALS.

ASSIGNED TO (JOB TITLE)	LOCATION

REV. NO.	REVISION DATE	INSERTION DATE	BY	REV. NO.	REVISION DATE	INSERTION DATE	BY
1st Ed	15 Jan 70						
2nd Ed	15 Jun 70						
3rd Ed	15 Dec 71						

1. CONFIGURATION STATUS CONTROL

Collins uses a 5-digit number to identify the configuration status of a unit/subassembly. This number is referred to as the configuration identifier (CI). A typical 5-digit CI is as follows:



Whenever a change (process, mechanical, or electrical) occurs, the CI changes. For example, if a subassembly configuration status identified by CI-69125 has an electrical component change on the 5th day of the 14th fiscal week of fiscal year 1969, then the new CI appearing on the subassembly would be CI-69145.

Note

The CI number is not a serial number because many units/subassemblies may exist with the same CI number.

In this element only CI's that result in schematic changes are covered. Therefore, if a unit/subassembly has a CI that numerically falls between CI's listed on the schematic changes page, the electrical configuration is represented by the lower CI.

Whenever possible, the CI is marked on the unit/subassembly approximately two spaces following the 10-digit part number. When this is not practicable, it is marked as close as possible to, but not immediately following, the part number. As an example, in a subassembly with high parts density, the 10-digit part number may appear on one side of the subassembly, the 5-digit CI on the other.

Note

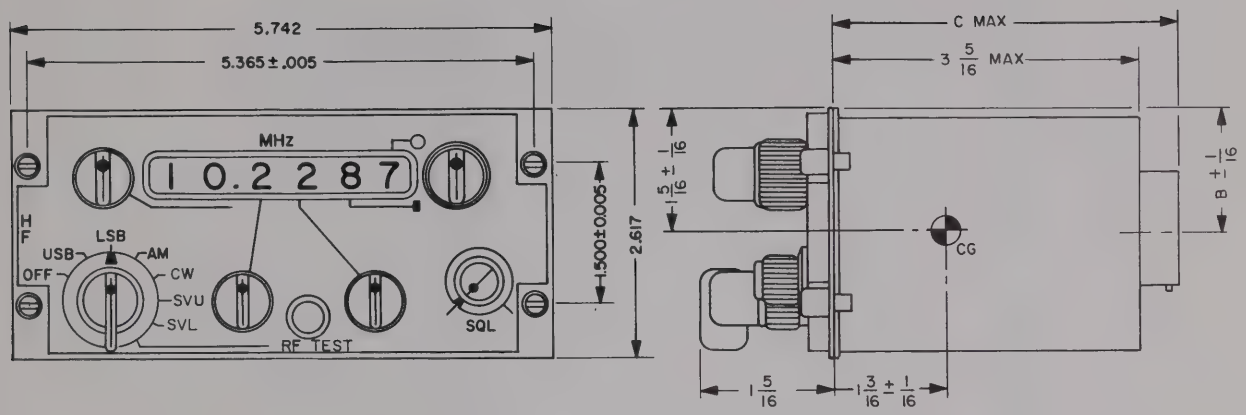
If two 5-digit groups appear on the same subassembly, the numerically larger (latest) CI would be used for configuration control.

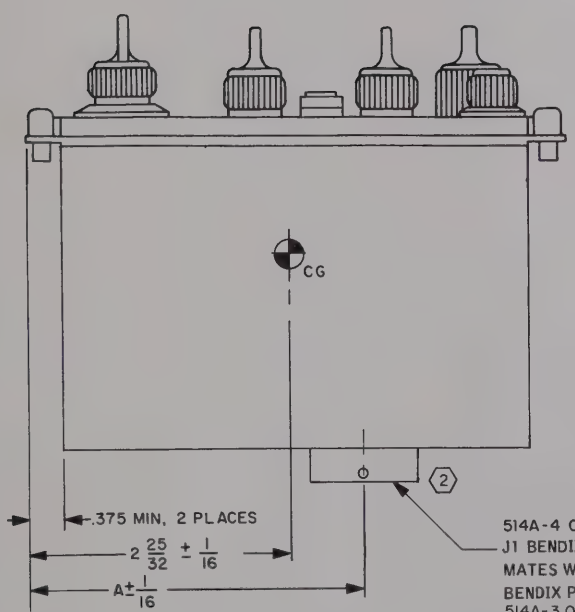
2. CONFIGURATION EFFECTIVITY

Refer to the schematic changes page preceding each subassembly schematic for any subassembly changes that may have occurred and the corresponding CI covering each change.

Listed below are the units/subassemblies with the latest CI covered by this document.

UNIT/SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
514A-3	792-6121-001	Not available
514A-4	792-6122-001	71316
514A-4	792-6122-002	71356
514A-5	792-6123-001	69526
Serial control transmit card A2	793-9264-001	71383





NOTES:

1. 514A-3/4/5 RADIO SET CONTROL ARE IDENTICAL EXCEPT FOR MAIN I/O CONNECTOR J1.
2. THE POSITION OF J1 VARIES SLIGHTLY BETWEEN THE 514A-3/4/5 RADIO SET CONTROLS. SEE CHART.
3. WEIGHT OF UNIT 2.25 LBS MAX.

TYPE	DIM A	DIM B	DIM C
514A-3	3 11/32	1 17/64	4 1/16
514A-4	3 5/8	1 5/16	3 25/32
514A-5	3 1/4	1 7/64	3 11/16

514A-4 ONLY
J1 BENDIX PIGMY TYPE PT02A-20-39P (CPN 371-2363-00)
MATES WITH
BENDIX PIGMY TYPE PT06A-20-39S (SR) (CPN 371-6204-00)
514A-3 ONLY
J1 MS3102A-28-15P (CPN 357-3196-00)
MATES WITH
MS 3106A-28-15S (CPN 357-4065-00)
514A-5 ONLY
J1 BENDIX PB02A-22-55P (CPN 371-1011-00)
MATES WITH
BENDIX PB06A-22-55S (CPN 371-1256-00)

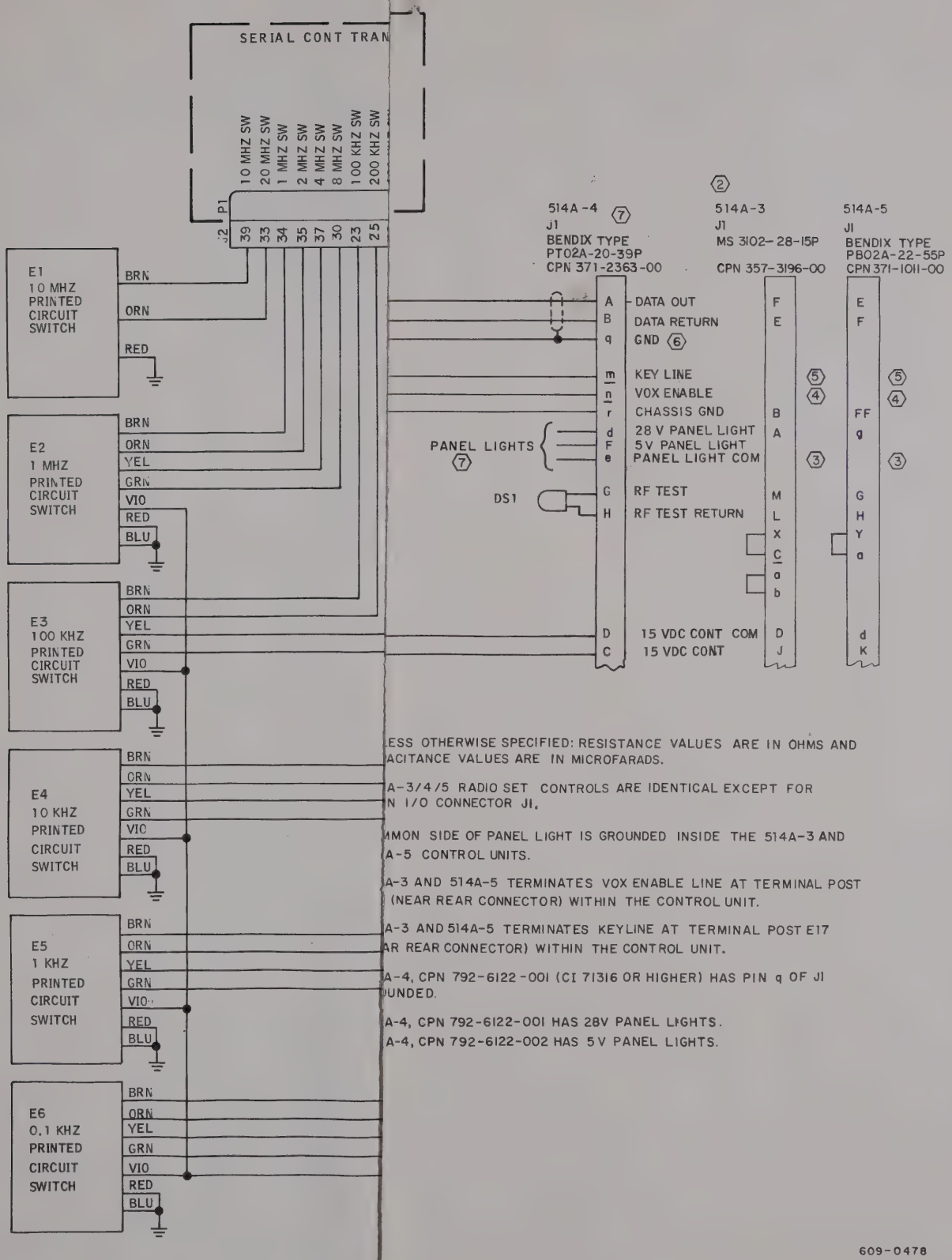
TP2-1695-014

Figure 1. 514A-3/4/5 Radio Set Control, Outline and Mounting Dimensions Diagram.

SCHEMATIC CHANGES

REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
A1	Grounded pin q on rear connector J1 for shield termination. Pin r is available for chassis ground use.		CI-71306

Figure 2. 514A-3/4/5 Radio Set Control, Schematic Diagram (Sheet A).



LESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS AND
ACITANCE VALUES ARE IN MICROFARADS.

A-3/4/5 RADIO SET CONTROLS ARE IDENTICAL EXCEPT FOR
N I/O CONNECTOR JI.

MMON SIDE OF PANEL LIGHT IS GROUNDED INSIDE THE 514A-3 AND
A-5 CONTROL UNITS.

A-3 AND 514A-5 TERMINATES VOX ENABLE LINE AT TERMINAL POST
(NEAR REAR CONNECTOR) WITHIN THE CONTROL UNIT.

A-3 AND 514A-5 TERMINATES KEYLINE AT TERMINAL POST E17
AR REAR CONNECTOR) WITHIN THE CONTROL UNIT.

A-4, CPN 792-6122-001 (CI 71316 OR HIGHER) HAS PIN q OF J1
UNDED.

A-4, CPN 792-6122-001 HAS 28V PANEL LIGHTS.
A-4, CPN 792-6122-002 HAS 5V PANEL LIGHTS.

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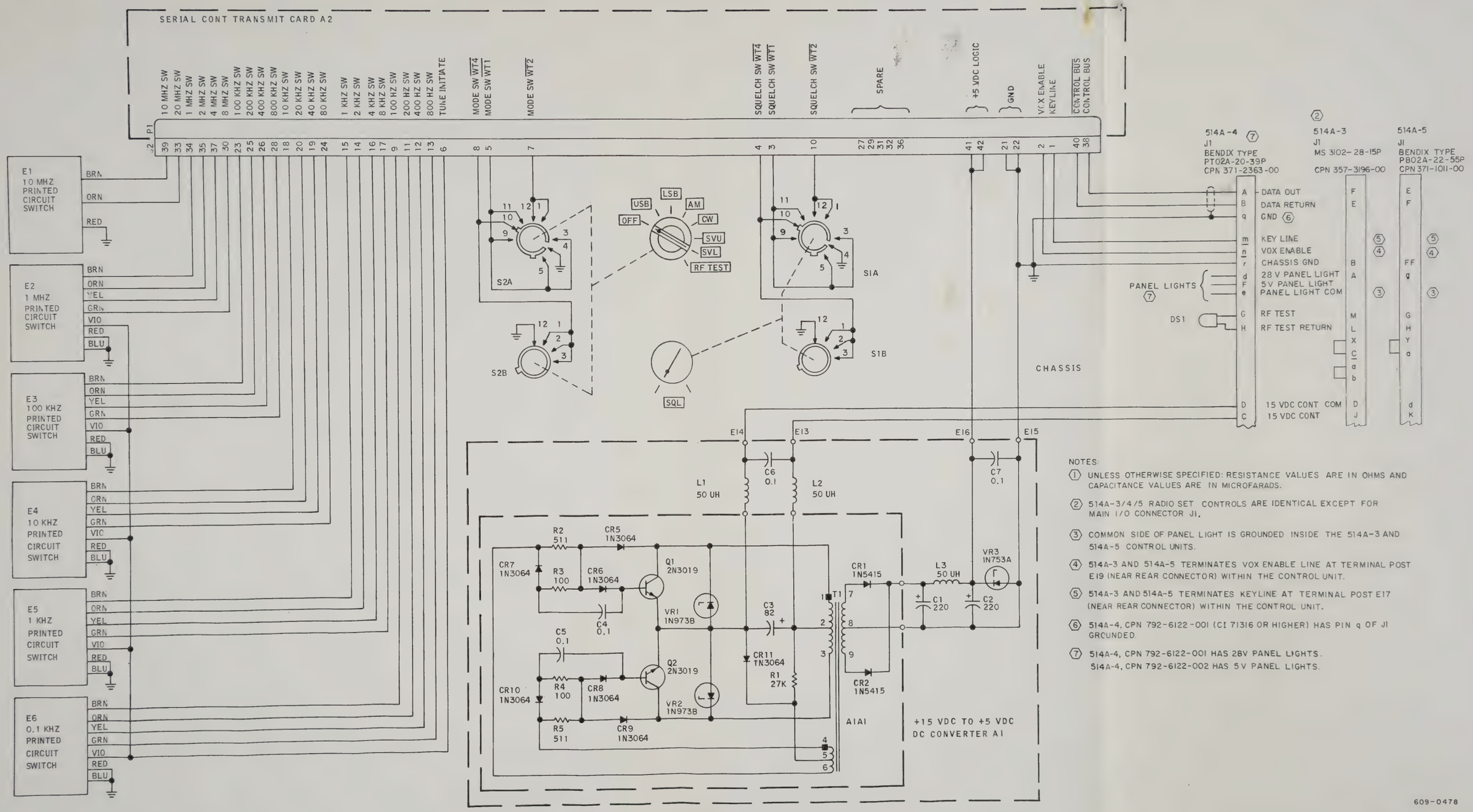
Figure 2. 514A-3/4/5 Radio Set Control, Schematic Diagram.



NOTES:

(1) UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.

(2) 514A-3/4/5 RADIO SET CONTROLS ARE IDENTICAL EXCEPT FOR MAIN I/O CONNECTOR J1.

(3) COMMON SIDE OF PANEL LIGHT IS GROUNDED INSIDE THE 514A-3 AND 514A-5 CONTROL UNITS.

(4) 514A-3 AND 514A-5 TERMINATES VOX ENABLE LINE AT TERMINAL POST E19 (NEAR REAR CONNECTOR) WITHIN THE CONTROL UNIT.

(5) 514A-3 AND 514A-5 TERMINATES KEYLINE AT TERMINAL POST E17 (NEAR REAR CONNECTOR) WITHIN THE CONTROL UNIT.

(6) 514A-4, CPN 792-6122-001 (CI 71316 OR HIGHER) HAS PIN q OF J1 GROUNDED.

(7) 514A-4, CPN 792-6122-001 HAS 28V PANEL LIGHTS. 514A-4, CPN 792-6122-002 HAS 5V PANEL LIGHTS.

609-0478

Figure 2. 514A-3/4/5 Radio Set Control, Schematic Diagram.

SCHEMATIC CHANGES

REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
A1	Added capacitors C5 and C6, 1200 pF, for noise filtering.		CI-71346
A2	Changed value of capacitors C5 and C6 from 1200 pF to 1000 pF.		CI-71383

Figure 3. Modulo-Two Transmit Circuit Card A2 (CI-70393 and Up), Schematic Diagram (Sheet A).

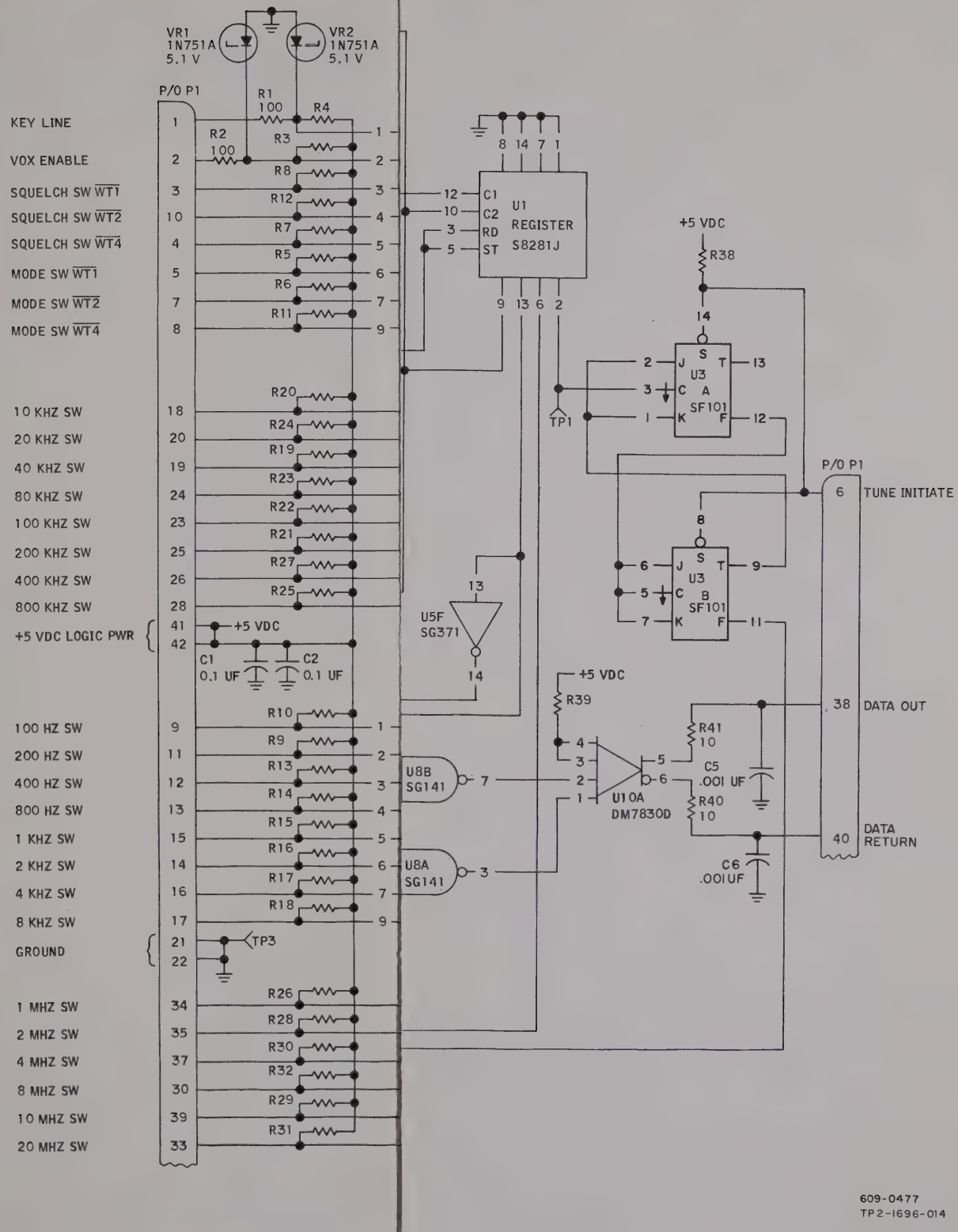
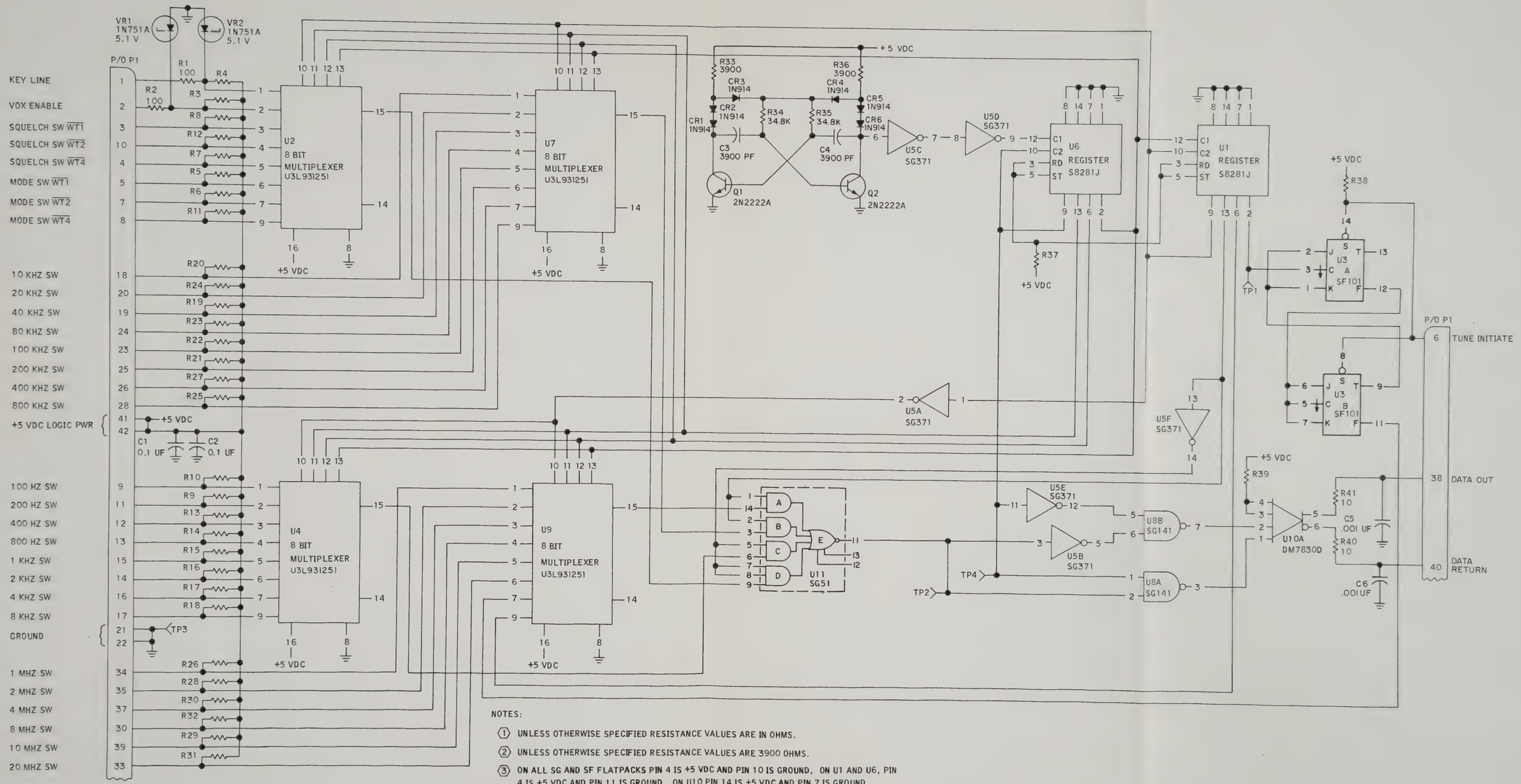


Figure 3. Modulo-Two Transmit Circuit Card A2 (CI-70393 and Up), Schematic Diagram.



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS.
2. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE 3900 OHMS.
3. ON ALL SG AND SF FLATPACKS PIN 4 IS +5 VDC AND PIN 10 IS GROUND. ON U1 AND U6, PIN 4 IS +5 VDC AND PIN 11 IS GROUND. ON U10 PIN 14 IS +5 VDC AND PIN 7 IS GROUND.

609-0477
TP2-1696-014

Figure 3. Modulo-Two Transmit Circuit Card A2 (CI-70393 and Up), Schematic Diagram.

SCHEM

REVISION IDENTIFICATION	DESCRIPTION OF AND REASON FOR

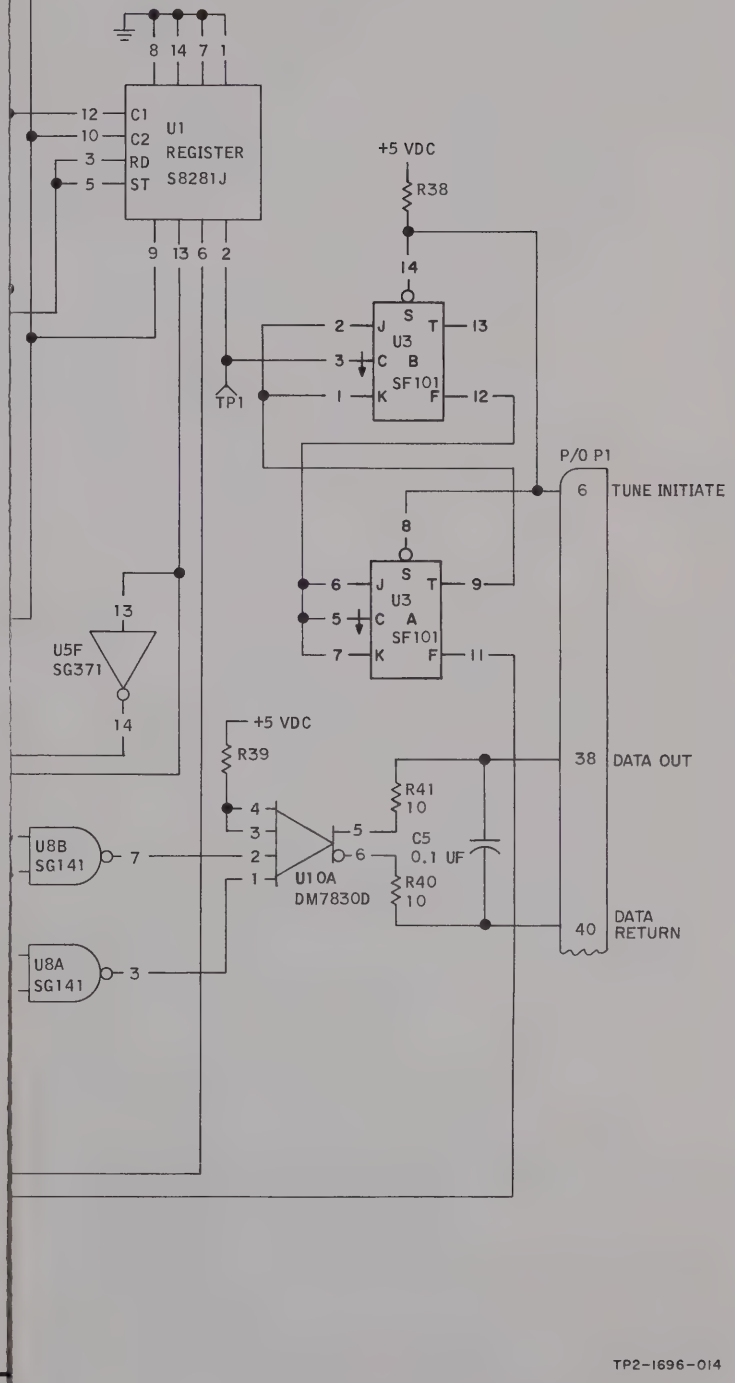


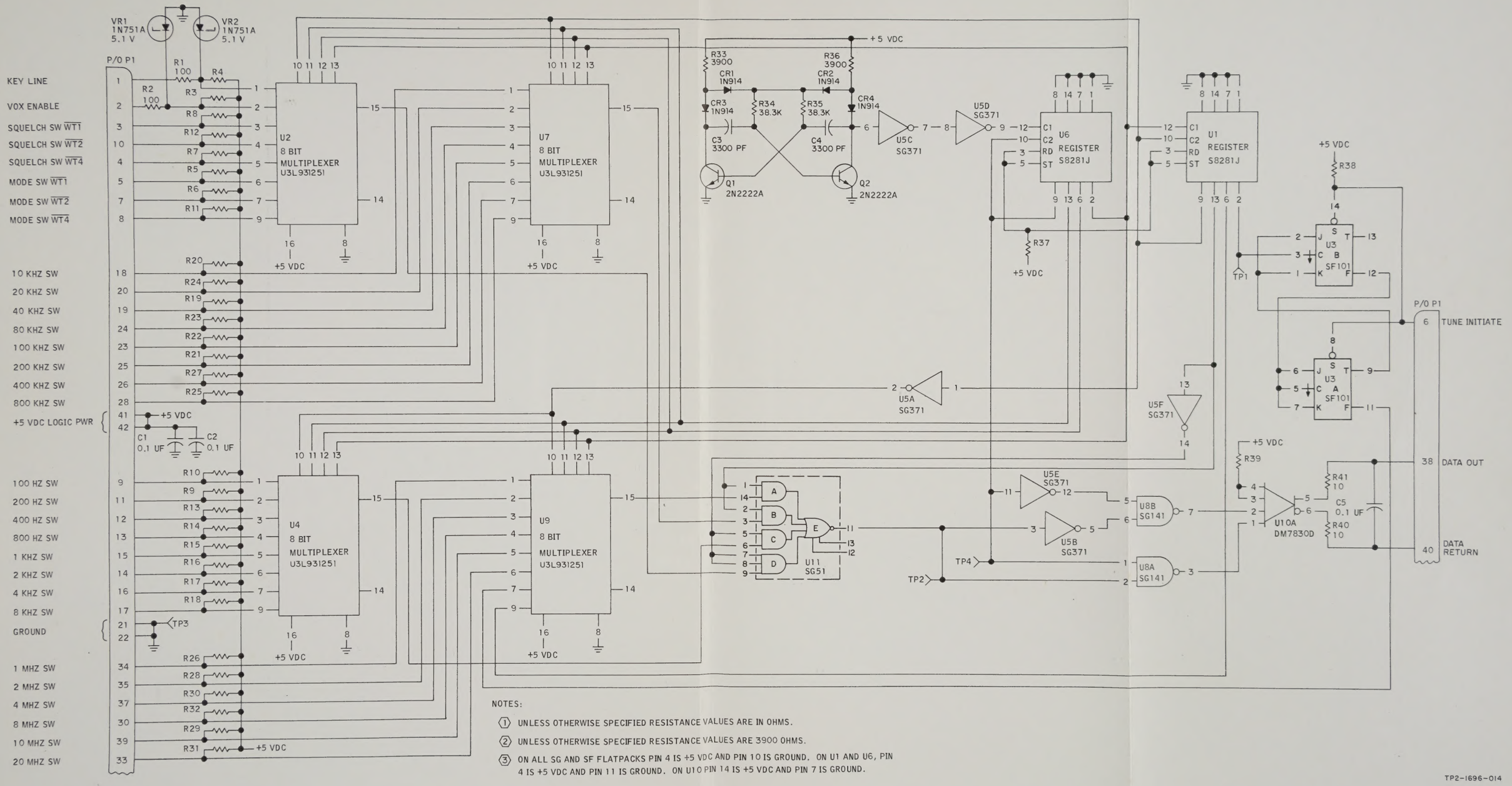
Figure 4. Modulo-Two Transmit Circuit C

Figure 4. Modulo-Two Transmit Circuit Card A2 (No Effectivity), Schematic Diagram.

SCHEMATIC CHANGES

REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

Figure 4. Modulo-Two Transmit Circuit Card A2 (No Effectivity), Schematic Diagram (Sheet A).



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS.
2. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE 3900 OHMS.
3. ON ALL SG AND SF FLATPACKS PIN 4 IS +5 VDC AND PIN 10 IS GROUND. ON U1 AND U6, PIN 4 IS +5 VDC AND PIN 11 IS GROUND. ON U10 PIN 14 IS +5 VDC AND PIN 7 IS GROUND.

TP2-1696-014

Figure 4. Modulo-Two Transmit Circuit Card A2 (No Effectivity), Schematic Diagram.

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